OLUME 25, NUMBER 1, MARCH 1989 ISSN 0001-3072

CVK-HO3017-2-P006641

ABACUS

A Journal of Accounting, Finance and Business Studies

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Published for the Accounting and Finance Foundation
University of Sydney
by
Basil Blackwell — Oxford and New York

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Editorial correspondence should be addressed to The Editor, ABACUS, c/- Department of Accounting, University of Sydney, N.S.W. Australia 2006. Business correspondence should be sent to Basil Blackwell Publishers.

ABACUS will be published twice yearly in 1989 and the annual subscription price is: institutions A$60.00, individuals A$30.00 (Australasia); institutions £30.00, individuals £15.00 (UK and overseas); institutions US$60.00, individuals US$30.00 (USA). Subscriptions include delivery from Australia by surface air-lifted post.

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Typeset by Solo Typesetting, South Australia
Printed in Australia by Impact Printing Pty Ltd

ABACUS

A Journal of Accounting, Finance and Business Studies

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P, 6641

ABACUS, Vol. 25, No. 1, 1989

FIFTH WORLD CONGRESS OF ACCOUNTING HISTORIANS
held at The University of Sydney
21–24 August 1988

Delegates from around the world attended the Fifth World Congress of Accounting Historians held at The University of Sydney in August 1988. The Congress was sponsored by the Accounting and Finance Foundation within The University of Sydney (the sponsor of this journal).

The Congress consisted of five Keynote Addresses and forty-one concurrent papers. The collected papers have been published under the editorship of Allen Craswell. (For details, see inside back cover of this issue.)

What follows is the Opening Address delivered by the Vice-Chancellor of The University of Sydney, Professor John M. Ward, AO; the Keynote Address by R. J. Chambers; and a paper by O. Finley Graves selected from the collected papers.

ABACUS, Vol. 25, No. 1, 1989

J. M. WARD

Opening Address: Fifth World Congress of Accounting Historians

I welcome the Fifth World Congress of Accounting Historians to the oldest and lar university in Australia. When The University of Sydney was founded in 1850, the distinction between traditional bookkeeping and accounting theory was not recogni Today Accounting takes its place with other disciplines of social sciences suc Economics, Law and History. Driven by economic necessity, bookkeeping accountancy have been transformed in this century by the growth of a large bod sophisticated theory. Accounting as we know it is the culmination of a long, diffi process in which a profession emerged by wrestling with economic and finan problems that had to be presented and understood through a new set of principl new way of looking at the problems of handling resources and of estimating calculating success in doing so. Accounting theory grew up as a development ou bookkeeping, economics and finance.

The first person to introduce me to the concept of theory of Accounting was eminent teacher, Professor Ray Chambers. I was certainly not a particularly apt p although a willing one. I did grasp the main point. That is why I have had spe pleasure as a social scientist, that is an historian and lawyer as well as a chancellor, in accepting the invitation of Chambers' successor here, Professor Mu Wells, to open this Congress and address you.

Last week Professor Wells advised me to begin my address with Pacioli, fifteenth-century Franciscan monk who is usually reckoned to have been the fath modern accounting. Yes, I had heard of Pacioli as a Renaissance man. Pacioli was only a monk. Pacioli was a mathematician and a professor, who taught at some o oldest and greatest of Italian universities. His *Summa*, published in 1494, when Middle Ages were giving way to the modern period of history, dealt with algebra with bookkeeping. The book was the first printed treatise on algebra and the printed text on bookkeeping. Those were great times. Pacioli was a friend of Leon da Vinci, who purchased himself a copy of *Summa* and later collaborated with Pa in another published book not, however, on bookkeeping. Pacioli was also a temporary of the great Columbus, who crossed the Atlantic in 1492, and of Pr Henry the Navigator. In those years of high achievement, when the inventio printing speeded up communication among people of intellect, there truly w renaissance of learning. Pacioli's distinctive claim to be remembered was that he

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Professor J. M. WARD, AO, is Vice-Chancellor and Principal, The University of Sydney.

The Fifth World Congress of Accounting Historians was held at The University of Sydney in August lown the principles of bookkeeping in the form in which they survived almost nchanged for more than three centuries. His work is still regarded with respect. It egan as part of the new learning and reflected the sudden expansion of commerce in he Italian republics, and the problem of how best to invest accumulations of capital. t reflected also the strengthening of mathematics in Europe that came from contact vith the Arab world.

Although there were distinguished writers on bookkeeping soon after Pacioli and a ignificant number of them were scientists or mathematicians of high repute to whom ookkeeping was a secondary interest, there was no great advance on Pacioli before he nineteenth century when another great expansion of commerce and of investment ccurred. This long period of no-growth is not hard to explain. The essential tools vere developing rapidly, notably mathematics, there was economic growth in plenty vith the European exploration of Asia and America. There were political economists, s the practitioners of the gloomy science were then known, in abundance from Adam mith onwards. There were treatises on the national debt. There were financial candals on a large scale—witness the South Sea Company imbroglio of 1720. There vas capital to invest and the need to evaluate comparative yields. There were attempts o calculate whether empires really benefited their mother countries. Nevertheless louble entry bookkeeping remained the most significant form of recording transctions, of estimating profit and loss and dealing with national accounts. Theory of ccounts was not yet explained or developed.

ineteenth century was the proximate cause of the rise of the modern accounting rofession. I am told that I should here refer to writings such as those of Fells on costs ccounts, of Pixley and Dicksee on corporation accounts, and to the establishment in cotland and in England of the Institutes of Chartered Accountants. The adding nachine, the wide use of logarithms, the rise of the stock and share markets, the aising of vast sums of money for purposes of war or peace and the development of nore elaborate forms of taxation all contributed to the emergence of the accounting rofession.

That universal genius Goethe spoke of bookkeeping as one of the finest inventions f the human mind. Whether he was ever a bookkeeper himself I do not know. His raise is worth remembering when we consider that the essentials of bookkeeping had een set out in the writings of Pacioli in 1494.

One difference to which I have been accustomed as Vice-Chancellor was that ransactions come to be seen as part of a process, not as a series of individual, isolated vents. The concept of profit yielded to that of earnings or income. Of course, this is elped in the case of the University by the fact that more of our activities have earnings han have profits and that some of our activities are simply the expenditure of money ranted or given to us for nominated purposes. These are often seen, especially by overnment, in the context of an excessively short time span. A longer view, such as ou might take, would calculate the possible benefits of particular forms of university xpenditure and do so in terms of the national economy, not merely the university udget. Here as you will see, I have been led into theory myself in a rather elementary ut not insignificant way.

It is interesting to speculate on which of two factors was the more important in developing accounting as a profession with a strong theoretical, critical basis. Was it I have suggested, the pressure of financial necessity as expressed in the rise of lar corporations, the increasing intervention of government policy in business a individual affairs, and the immense difficulties of assessing costs and benefits related particular courses of complex action? Or was it the growing complexity of all social sciences themselves? It is fifty years since I finished my undergraduate course History, which became my profession. It is over forty years since I completed my L courses. In both cases, History and Law, the subject has been transformed sinc completed my undergraduate work. Each subject has widened in scope and endeavoured to develop theoretical bases. It does not much matter that theories historical explanation, interpretations of history and concepts of what history it really is, still differ. The point is that continuous academic study of the subj continuous professional practice of it and continuous contact between historians a other social scientists have changed the fundamentals of the subject. Much the sa has happened in Law, where law schools and the courts have made hard law and increase of legislative intervention in public and private business has forced us develop ideas about the province and the function of law beyond those of preced and judicial wisdom.

So far as I understand it, the same has happened to the accounting professi Bookkeeping as such may not have changed its fundamentals greatly (although I not sure that those who say this fully appreciate the impact of computers and ot machines). Accounting, on the other hand, has become an extraordinarily subtle a complex discipline just at the time when we speculate more and more about finan management, public policy, long-term use of resources and relative costs as someth much wider than mere profit and loss. In a sentence, accounting has become one of most important and respected ways of analysing public and private policy, public a private finance, public and private enterprise.

Pacioli in 1494 was preoccupied with the concept of the single proprietor, w might, of course, be a group of individuals. It was not until the nineteenth century t modern transaction analysis was developed so that real situations rather than un fictions (notably the personification of accounts) were gradually abandoned.

In the twentieth century we have seen accounting develop as one of the most ex and subtle instruments at our disposal for assessing the choices that must be mad the use of resources. This is true of a university, a corporation, a nation or (from 19 with the greater part of a continent. Accounting, I venture to think, will intertw itself with the less numerate parts of the social sciences and be valuable to them Even the historians have Cliometrics, the practice of applying accounting analysis past events for which often enough the figures are themselves guesses based on slen evidence.

The supreme stage of a social science is when it consciously develops its own hist which is your business here. I congratulate you on being able to reflect on the hist of your profession and the evolution of its theory. That is a civilized and useful ta May you enjoy it together.

It is with immense pleasure that I declare open the Fifth World Congress Accounting Historians.

ABACUS, Vol. 25, No. 1, 1989

R. J. CHAMBERS

Time in Accounting

All actions and the financial consequences of all actions are uniquely dated. The dates of actions and consequences are essential elements of their description and essential inputs to their understanding. However, in the course of time, the temporal uniqueness of financial events has come to be disregarded in periodical aggregative accounting. To this dereliction is attributable much of the confusion in argument and infelicity in practice that has stultified the striving for a perennially serviceable style of accounting.

Key words: Accounting periods; Accounting policies; Accounting procedures; Timing differences (ACC).

THE PASSING OF TIME

I am provoked to consider 'time in accounting' by the cavalier fashion in which dates and times are treated in expositions of accounting ideas and in accounting practice. I am of the opinion that a great deal of what passes for explanation and justification in accounting is deficient and misleading through disregard of the disciplinary nature of experienced time. To establish this will require mention of some quite commonplace things. But things we consider commonplace in ordinary affairs are often neglected or twisted to buttress what is popular, fashionable or self-serving. That is why they deserve notice.

We speak of time and the passing of time; of past, present and future time. Having in mind the indefinite extension of imaginable time, into the past and into the future, some speak of time as a continuum. But with reference to human thought and action that idea is empty. All thoughts and actions occur in some specified present moments, moments which sharply distinguish the past from the future. Past events and occurrences, and accounts of them, we describe as historical. Statements about the future we describe as predictions, prospects or expectations. We use different verb-forms as clues to the temporal reference of events. Yesterday was Tuesday; today is Wednesday; tomorrow will be Thursday. These usages would be superfluous if time were reversible. But time is irreversible. So also are events and their consequences; we cannot experience the consequences of an act before action is taken, or of an event before the event occurs. Time is a datum; we cannot stop it; we cannot turn back the clock. The temporal framework disciplines all we do and may discipline all that can properly be said about past, present and future.

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This paper was presented at the Fifth World Congress of Accounting Historians, Sydney, August 1988.

The human propensity to form expectations and plans in the light of the past an present is near enough to universal. We commonly claim to be guided by experience we often are very confident of what we claim to know by experience. But, o reflection, experience turns out to be a compound of quite dubious character. I includes events in which we have been participants as principals, as agents and a observers; different roles, different experiences. It includes the judgments we hav made of the relationships of antecedents to events, and of antecedents and events t their consequences. Those judgments, in turn, depend on how we have learned t interpret what we experience; they are conditioned by the seldom-questioned viewpoints of instructors, superiors and peers. Further, since individual experiences ar multitudinous, the capacity of the human memory is limited, and great reliance i therefore placed on records of events, what we claim to know by experience depends very much on the quality of those records—what is recorded, what is omitted, and th correspondence of the temporal sequence of the record with the temporal sequence o the events.

Accounting deals with a particular class of temporally ordered events and occurrences—financial events and occurrences. The purchase or sale of a parcel of goods is a commercial event having legal, mercantile and financial consequences. Accounting is concerned dominantly, if not solely, with financial consequences, such as the emergence of a debt or a change in a cash balance. These are of the class of events described as financial events. To every such event there is a moment of occurrence, a date that is an essential feature of the event, a date that is required to be made an element of the recorded description of the event. The date is a moment in real time, just as the event marks a change in the real financial state of the transactor. Further, every series of financial events occurring between specified dates has a cumulative consequence, suggestive of the courses of action that are then financially feasible and desirable. Clearly, if the dating of financial events or the temporal classification of any event(s) is in error, the cumulative consequence up to the terminal date of any series of events will be in error. It will not correspond with the real financial state of the transactor; it will mislead him.

Even a complete and rigorously ordered account of financial events (or the financial aspects of commercial events), however, is not understandable or interpretable without recourse to records of other aspects of commercial affairs. The course of the financial affairs of any person or firm may be influenced variously by the course of interest rates, exchange rates, employment levels, the money supply, saving and investment, the general level of prices, the structure of commerce and industry, and so on. Changes in all of these things occur at or near specifiable dates; they may reasonably be associated with changes in liquidity, asset composition, debt dependence and profitability, only if the financial records are disciplined by the same temporal order. But even if we set aside the past on the ground that inferences drawn from past temporal coincidences are of dubious merit as guidance, we cannot set aside recording the past, fully and in order, if the past is used in any way to explain or describe the dated present. To do just that is, of course, one of the principal functions of accounting.

ACCOUNTING AS HISTORY

here is abundant evidence to the effect that accounting is intended to be or believed o be historical. 'Financial accounting is . . . primarily historical in character' (May, 943, p. vii). '. . . [A]ccounting may be viewed as . . . a history of the capital committed to business venture' (Hill and Gordon, 1959, p. 5). 'Accounting is historical; it can eport only on the past' (Littleton, 1970, p. 478). Some have contrasted this posited istorical character with other possible contentions. 'Accounting is . . . concerned only ith those actions which were taken, not the opportunities forgone or anticipated for he future' (Marple, 1964, p. 113). 'Accounting has no facility for reporting "what ight have been"' (Littleton, 1970, p. 480). Perhaps the most pervasive indications of he historical character of accounting are the dating of original entries and the use of he rubric 'historical cost accounting' to designate the most widely taught and ractised style of accounting.

One of the distinctive features of histories and of historical statements is that they ppear to be and purport to be factual, to state what was the case at some specified ate or during some specified period. Its date is of the essence of the truth of any istorical statement. An historical statement is said to be a true statement if what it sserts has been found, by appropriate inquiry, to have been the case. Many of the rocesses of accounting and auditing are directed to ensuring that what is recorded (or eported) is factual, authentic, true, as to description, amount and date. A long line of minent writers on accounting have set up truthfulness as a (or the) prime quality of ccounting (e.g., Hatfield, 1909, p. 170; Cole, 1915, p. vi; Montgomery, 1937, p. 400; ittleton, 1953, p. 10). Since it is impossible to authenticate a statement relating to any uture financial event, the practices and dicta referred to may be taken as confirming he historical nature of accounting.

That the products of accounting are (or should be) of guidance in the conduct of ffairs has long been believed. There are hints of the belief in Pacioli's treatise (1494). hompson (1777, Vol. II, p. 1) described double entry bookkeeping as 'the art of eeping our accounts in such a manner as will not only exhibit to us our net gain or oss upon the whole, but our particular gain or loss upon each article we deal in, by hich are we instructed what branches to pursue and which to decline . . .'. Quin 1779, p. 11) averred that, given 'the necessary regularity in keeping accounts . . . a an can tell at one view whether his manner of living is suited to his fortune, he will onsequently be enabled to . . . be guided against extravagance'. Gordon (1787, p. 9) eld that 'a faithful register' of the transactions of a merchant 'is absolutely necessary, ot only to the welfare and prosperity, but to the very being of his trade'. The last sixty ears have produced numerous allusions to the use of the products of accounting in nancial administration and by those who trade in securities.

The credulous will find all of this comforting. In practical affairs we value history uch more highly than fiction, truth more highly than falsehood, the useful more ighly than the decorative or incidental. It is natural to want to believe in the virtue of hat one does and in the value of its outcome. Of course, 'wanting to believe' does not ring about the content of the belief. However, if it is said often enough that 'accounting is historical', 'accounting is factual', 'accounting is concerned with true representations', 'the products of accounting are useful', the very repetition tends to create the illusion, or delusion, that they themselves are true and reliable statements. The history of accounting ideas and practices is, as yet, not satisfactorily documented. But what we have is sufficient to indicate that none of these dicta is reliable, and that the persistent belief in them as descriptions of accounting and its products is folly.

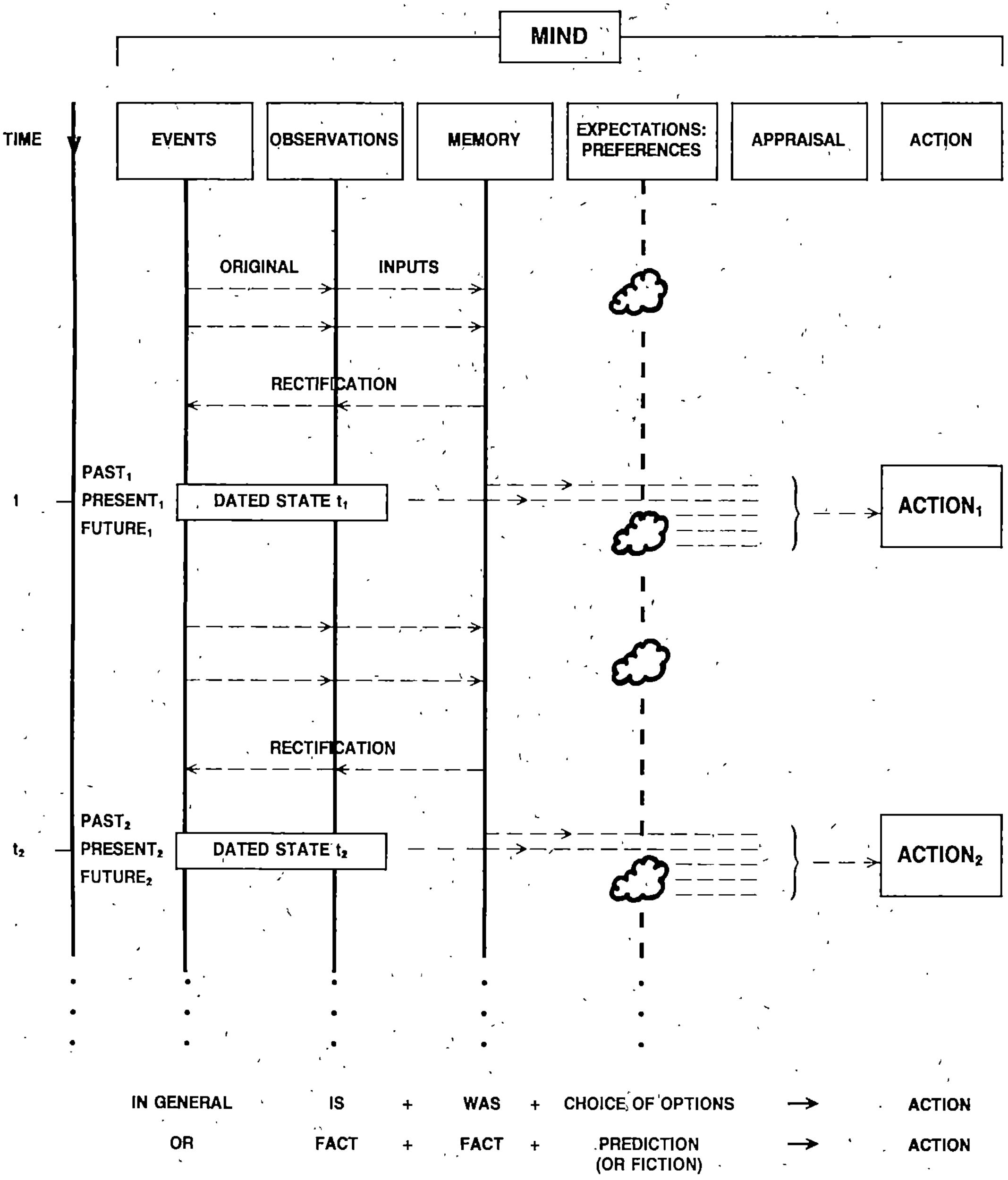
It may not be easy to swallow the suggestion that practices almost universally taught and practised are fallacious. We come to believe from our early years in the human capacity for human betterment. To many that means that the prevalent knowledge and skill of any age is as free of error as human ingenuity can make it, and that what is false is assuredly and promptly supplanted by what is truer or more efficacious. This view of the course of invention and discovery is optimistic, palatable, congenial. It runs parallel with the metaphorical use of 'evolution', as if there were some coercive non-human, non-volitional principle that secures the survival only of ideas and devices that outrank their 'competitors' in service to humankind. There is no such principle. All changes in the human condition, other than those due to catastrophic geophysical causes, are products of the interactions of the ingenuity, curiosity, complacency, idealism, greed, egocentrism and altruism of mankind. Under the influence of these antithetical attributes, civilizations, kingdoms, states, cities, social institutions, systems of ideas and technologies have risen to eminence, have enjoyed short or long periods of dominance, but have withered or been supplanted when their fitness became undermined by folly or overcome by force. The histories of nations, states, enterprises and intellectual endeavours are liberally spiced with mistakes—ideas and artifices that survived long after their unfitness, flaws and infelicities should have been apparent. Examination of the ways in which temporal notions have been used and abused strongly suggests that conventional accounting is such a mistake.

THE PRESENT TIME

It is widely held that accounts are the source of inputs to judgments of past performance and to the present choice of courses of action. The earlier references to Pacioli, Thompson, Quin and Gordon testify to its longevity. May (1943, p. vii) put it in a nutshell: financial accounting has 'for its most important function the extraction and presentation of the essence of the financial experience of business, so that decisions affecting the present and future may be taken in the light of the past'. (See Fig. 1.)

Every judgment, decision and choice is made at an identifiable 'present' moment, in the context of the present state of the process, person or other entity by or for which the judgment or choice is made (e.g., Dewey, 1939, p. 33; von Mises, 1949, p. 209; Boulding, 1970, p. 54). In financial affairs the pertinent state is the financial state or position. Knowledge of the present financial position is thus one of the inputs to judgments and choices. The discovery of a present position is, indeed, of dominant significance, since that position is the resultant of all prior financial experience, and the means and constraints governing the pursuit of some preferred position. I shall take the present financial position of a person or firm to be the relationship between the

Fig. 1. Information, Appraisal and Action



"Mind" stands for the cognitive and evaluative processes of any person acting on his own behalf, or on behalf of say, a firm. Given perfect (or rectified) observation and memory, the past and present at t_1 are factual. Those facts give rise to conjectures and wishes in respect of the unknown future (the "cloud" in the line of "expectations:preferences"). Action is the joint consequence of past and present facts and judgements. Knowledge of the state at the date of action is crucial.

value or worth (i.e., the moneylikeness) of the assets, the debts owed and the residu interest in the assets of the person or firm (his or its capital) at any present tim Discovery of the amounts of cash balances and of debts owing and owed at an present date poses no major problem. The value or worth of other assets, however, i volatile, subject to the impact of commercial, economic and social influences. It mus be discovered at any date when knowledge of financial position is required. Th handbooks, manuals and other material of the past half-millennium provide some clue to the valuation of these assets in a manner consistent with the dated exercise of choic and judgment.

Pacioli gave one example only of a merchandise inventory; the merchant wa instructed to value it 'according to current prices' (Brown and Johnston, 1963, p. 56) Schwarz, chief accountant of the business of the Fuggers, devised (*c.* 1550) a system o accounting under which the 'profit is determined by comparing two statements o capital at two different moments. The merchandise inventory is valued at "what it wil bring in"' (ten Have, 1976, p. 47). Malcolm (1731) would value houses and ships a 'first value', 'or you may choose to state them at another value from time to time, as you think they are then really worth' (Yamey, Edey and Thomson, 1963, p. 110). Stephens (1735, p. 2) wrote of the worth of an asset as what people will give for it. Hayes (1741) said it was usual for merchants to value goods at 'the market price they then go at' (Yamey *et al.*, 1963, p. 116). Harris (1842) would have valued inventory 'at the price for which you could sell it' (Littleton, 1933, p. 151). The constitutional rules of some U.K. companies in the 1830s provided for periodical balance sheets in which assets were to be 'estimated, not at the cost, but at the selling price thereof' (Ma and Morris, 1982, p. 52). Similarly, a partnership agreement of 1858 provided for the striking of an annual balance in which assets were to be stated at their 'net realizable worth at the time' (Gray, 1986).

Over the same interval certainly there were advocates of the use of cost and cost-based values for merchandise and durable assets. Over the last hundred years they have far outnumbered the advocates of the use of dated, present, prices. But the use of dated market selling prices has not been altogether supplanted. For the best part of a hundred years the textbook literature has endorsed the balance sheet valuation at current selling price of merchandise inventories in the primary industries. Investment companies which sell and buy back their own units at the net asset value per unit have obviously to keep present selling prices of their security holdings under notice. And the pertinence to private persons of knowledge of the current values of their assets is acknowledged by the recommended use of those values for personal reckoning.

All of these references to the use of present or presently dated prices for non-money assets are consistent with the use of the products of accounting in making judgments and choices. There has never been any dispute about the propriety of using dated prices to record the consequences of dated transactions. Nor, where accrual accounting is endorsed, has there been any dispute about taking into account contractual (priced, and therefore calculable) interest charges and like items, up to the terminal date of an accounting period. Why then is not the use of present prices endorsed for all assets of all firms when drawing up, in our own time, statements purporting to represent present (or recently past) financial positions?

HIGGLEDY-PIGGLEDY TIME

'aluation on the basis of original purchase prices is described by some as traditional, y some as conventional.

'Traditional' is a time-loaded term. Its usual reference is the persistence over a long eriod of a belief or practice. It skirts the identification of a date of origin and of an riginator. It carries an overtone of survival through divergent conditions and circum:ances; we speak of such beliefs and practices as 'time-honoured'. The propensity to elieve in the merit of relics of the past is no doubt what underlay Bacon's dictum: ime is the greatest innovator'. But to it he added the rhetorical question: 'if time of ourse alter things to the worse, and wisdom and counsel shall not alter them to the etter, what shall be the end?' (1625, p. 74). Tradition is not to be set above wisdom nd counsel. The recurrent references to present or current prices illustrated in the revious section suggest that original cost valuation is not traditional. The Study iroup on Business Income (American Institute of Accountants [AIA], 1952, p. 25), ıdeed, affirmed that prior to 1914 'the realization postulate and the related "cost rinciple" were not a part of accepted doctrine'. Those ideas gradually influenced ractice in the U.S.A. through test cases on taxable income after 1914; taxable income ., of course, a convenient fiscal fiction, related only at certain points to income as an ıcrement in wealth. There were, in any case, numerous instances of asset revaluation ı the U.S.A. during the 1920s (Fabricant, 1938); and the practice has had a long istory, before and since that time, in other countries. It seems highly probable that the :alization and cost doctrines became entrenched in the pedagogical literature, and ıence in practice, through the *Tentative Statement of Accounting Principles* of the .merican Accounting Association (1936), reinforced by the proscription of upward :valuation by the SEC shortly thereafter. Their origins date much earlier than this, owever, incircumstances presently to be noticed.

If not traditional, then, is the cost principle conventional? 'Conventional' may mean etermined by general agreement or determined arbitrarily, as when there seem to be o clear grounds for the solution of a problem or the resolution of differences. However, if the outputs of accounting are to be inputs to dated judgments and choices, there at least one clear ground for using identically, and presently, dated valuations. There ıust be adduced more weighty grounds than this for adopting prices of other dates.

It is difficult to be precise about the nature and timing of arguments supporting the se of original purchase prices. That the prices or values of assets are apt to change 'ter their purchase is implicitly acknowledged in the 'lower of cost and market' rule ır inventories, in the description of depreciation as decline in value from whatever ıuse, in the attention given to 'fluctuation' as distinct from depreciation from the end [the nineteenth century, and so on. But there was no definitive description of eriodical income or profit in the literature. There were references in judicial opinions) the balance sheet as a truthful representation of a company's state of affairs; and ırly in the twentieth century, textbooks were referring to the balance sheet as a .atement of the true financial position. But neither 'state of affairs' nor 'financial osition' was given sufficient treatment to make the dates of periodical valuations ıtegral and necessary elements of balance sheet representations.

The consequence was higgledy-piggledy dating, then and now. By way of illustratio

1. The balance sheet, widely described as a statement of financial position at stated date, commonly contains assets stated at or based on prices at other, ofte distant, dates. The practice implies that every dollar, however recently or distantl spent, is equal in some financial sense to every other dollar at the balance shee date. That is patently false. If the purchase dates were shown for every asse shown 'at cost', it could be said that each component statement was historicall true. But when the only date given is the balance sheet date, 'at cost' implies a that date; and that is historically false. Further, a dated statement whic represents components by diversely dated prices is, as a statement of date financial position, historically false.
2. The charge for depreciation and the consequential revision of residual value is compound consequence of the use of a past-dated price (the cost of the asset), future selling price (the expected scrap or resale value), and an assumed mode o diminution of value over the conjectured intervening interval. That consequenc purports to be a representation of a presently dated event—yet the present dat enters into its derivation in no way whatever!
3. Injunctions against taking account of periodical changes in the prices of durabl assets entail the dating of those increments or decrements in periods other tha the periods of their occurrence. In effect, historical events are disregarded, and what comes to be recorded is garbled history.
4. More generally, although the accounting period has long been endorsed as the determinant of what should be incorporated in the accounts of successive intervals, the dates of revenues have become an overriding consideration, and hence a contradictory rule, under the 'matching' doctrine. Expenses, whenever incurred, are to be associated with actual or expected revenues. As expectations may vary from the utterly gloomy to the rosily optimistic, expenses can be charged immediately or amortized over short or long intervals. Apparent income could be smoothed; cut loose from association with dated financial positions, it could distort to an undisclosed extent the representations of periodical changes in discoverable net wealth.

Summarizing its survey of ideas up to 1913, the Study Group on Business Income noted that 'cost was often used as the best or conservative measure of value in a period when prices generally were rising . . . The transition to the idea that cost was used *as such* was easy' (AIA, 1952, p. 25, emphasis in original). Ease, simplicity, convenience—were these the 'more weighty grounds' than pertinence to dated judgments and decisions that determined the course of doctrine and practice?

TIME INVERSION

So little disciplined by the irreversibility of time are some processes and their rationalizations that time sequences have become inverted. Perhaps the simplest examples occur in vague prescriptions on asset valuation, even when the cost basis of valuation is endorsed. Cost of inventories, it has been said, may be determined under any one of a number of assumptions; 'the major objective in selecting a method should be to choose the one which, under the circumstances, most clearly reflects periodic ncome' (American Institute of Certified Public Accountants, 1961, p. 29). To 'most clearly reflect' periodic income, we must know what periodic income is; that cannot be known without the value of a closing inventory. The above statement of objective is thus viciously circular; the practice it enjoins obliges the valuer (manager or accountant) to fall back on his intuition about periodic income in the very course of calculating it!

An older example underlies the longstanding definition of fixed assets—assets acquired for the purpose of earning income and not for resale. Because they are held permanently and not for resale, it is said, fluctuations in their prices may or should be disregarded. But intention before the event has nothing to do with value after the event. The volatility of the environment and the varying fortunes of firms as they engage with it make changes in operations and asset holdings sometimes compelling, sometimes desirable and sometimes highly profitable. To canvass the possibilities of any of the many feasible changes at any time, the dated values in exchange of existing assets are the only uniformly pertinent data. Some contend that, if a firm has already decided to continue possession and use of an asset, its selling price is irrelevant (e.g., Edwards and Bell, 1962, p. 98ff.). But to suppose that decision already to have been made in no way forestalls the potential necessity of revoking it when the full array of data—asset composition, debt dependence, rate of return and so on—are brought under periodical notice.

Inversion in full dress is perhaps best illustrated by the contention that, since net present value is the common criterion for choice among options (i.e., before the event), it is the appropriate way of valuing assets and determining profits after the event. In terms of choice and action, before and after are not simply successive points on a time continuum. They are categorically different. Before a decision of any consequence is made, the options available are limited only by the opportunities and the spending power, in any form, available. Other things being equal, the decision rule is: Choose that course of action for which the net present value is greatest. A net present value calculation is dated. But its substance is a figment, a compound of imagined future events or sequences of events, and discounting factors. At any point in any sequence of events there will arise new options, for the conditions of the firm and its commercial context will vary in ways unforeseeable. For that reason every net present value is a simplified calculation of a prospect. In no sense is it historical; 'the future is not there to be discovered, but must be created' (Shackle, 1969, p. 16). On the other hand, after the event, that is, up to any present date, all that has gone before has already had its impact on the financial affairs of a firm. There are no 'optional impacts' of past events. The events are unique; their effects are specifiable; events and effects alike are historical. They have been experienced. To record them it is necessary only to discover them, all of them, up to the point of action or of any summarization of the upshot of the past. (See Fig. 2.)

Conventional accounting has never been a complete historical record. By deliberate intent the periodical effects of changes in durable asset prices and the purchasing power of money have been ignored. Deliberately the accounting period has been endorsed as a temporal ordering device; but just as deliberately it has been flouted by accruing and deferring the effects of dated events, as, for example, in tax allocation,

Fig. 2. Conventionalized Information and Action

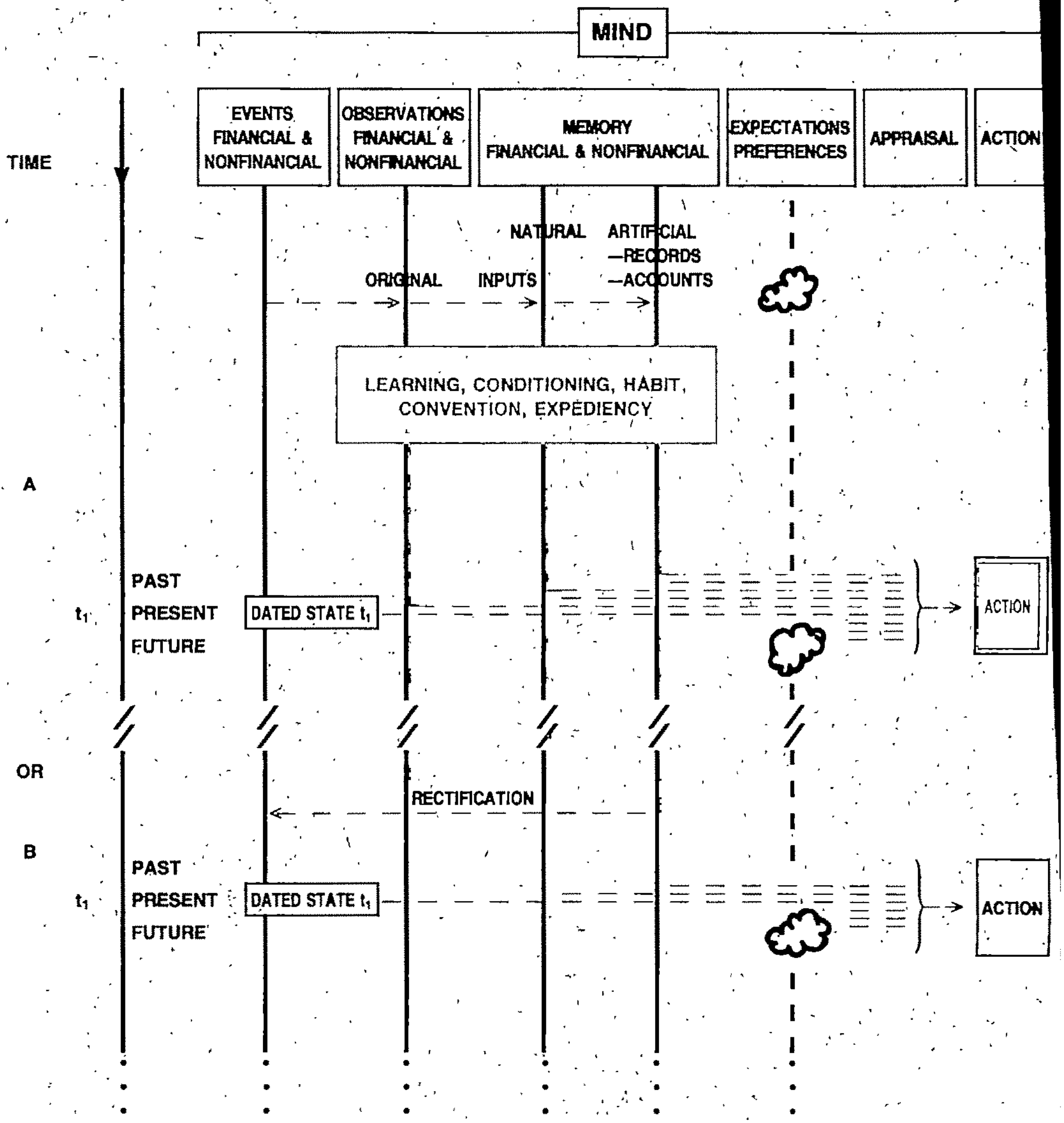

MIND
EVENTS FINANCIAL & NONFINANCIAL
OBSERVATIONS FINANCIAL & NONFINANCIAL
MEMORY FINANCIAL & NONFINANCIAL
EXPECTATIONS PREFERENCES
APPRAISAL
ACTION
TIME
NATURAL
ARTIFICIAL —RECORDS —ACCOUNTS
ORIGINAL
INPUTS
LEARNING, CONDITIONING, HABIT, CONVENTION, EXPEDIENCY
A
PAST
t_1
PRESENT
FUTURE
DATED STATE t_1
ACTION
OR
RECTIFICATION
B
PAST
t_1
PRESENT
FUTURE
DATED STATE t_1
ACTION

Fig. 2. is an extension of Fig. 1. It distinguishes between financial and non-financial matters. It introduces the artificial memories (records and accounts) characteristic of complex undertakings. It introduces an overlay of "learning, conditioning, habit, convention, expediency" which affects how much of an experience (event) is actually sensed and how it is sensed; what is remembered and what is forgotten by the natural memory; and what is included in and what is excluded from the artificial memory. The upshot (Part A) is the mixture of fact and convention (potentially in conflict) that complicates appraisal and confuses action. Part B indicates that only by fresh and exact observation (rectification) at t_1 may the effects of errors and conventions be eliminated.

oodwill amortization and like matters. If the irrelevance and the unrealistic nature of e result should come under attack by men of affairs, ineluctable ignorance of the ture could be pleaded (and has been pleaded) as the unfortunate lot of men of ccounts. Couple that with the notion that decision makers are more interested in the ture than in the past, and the rationalization of time inversion is almost complete. owever, it overlooks entirely the dominant role of knowledge of the immediately resent state of a firm as the endowment of the past and the capacity to exploit the uture.

How, then, has this come to be overlooked when, as has been shown, there has been vidence at least since Pacioli of association of knowledge of the past with choices ade to bring about an imagined future?

THE SECRET PAST

he explanation seems to lie, in part at least, in an aspect of human behaviour scarcely oticed by historians of accounting ideas. To keep secret or private their intentions to ct, their capacities for action, and some actions themselves, is a common propensity f individuals and organizations of every kind. The history of concealment, misnformation and disinformation is as long as the history of mankind. Since so much ay be done with wealth and so little without it, financial affairs especially have been onsidered to be private, confidential—to be disclosed only for clear advantage or nder threat of damage, and then only to the extent necessary. The tactical advantages f secrecy, in bargaining and negotiation and trade generally, are attested by the care ken to preserve it.

For at least six hundred years businessmen have taken steps to keep their financial ffairs secret, from servants as well as outsiders. At the beginning of the fourteenth entury, many Italian firms kept a *libro segreto* or secret account book, dealing with e salary accounts of branch managers and other employees and the distribution of apital and profits (de Roover, 1956, pp. 124–31). In a section on 'secrecy in ccounting', Yamey *et al.* (1963) gave extracts from Peele (1553), Weddington (1567), afforne (1660) and Colinson (1683) making clear reference to keeping secret the ubstance or inventory of the master or merchant. The inventory was a dated list of oods, merchandise, claims on and by others, and the 'net rest' or amount of the state. The practice has survived:

> . . . the private ledger . . . which is provided with a lock and key and is sometimes kept by the chief clerk or accountant who occupies a confidential post, often includes [capital and drawing accounts, and] other accounts of a private nature . . . Another method is to keep all the expense accounts in a nominal ledger, and to put all the real or property accounts . . . into the private ledger . . . Without knowing the value of the stock at the commencement and end of a period, it would be impossible for any clerk to arrive at the gross or net profit, even though he had access to all the other information. (Carter, 1923, p. 218)

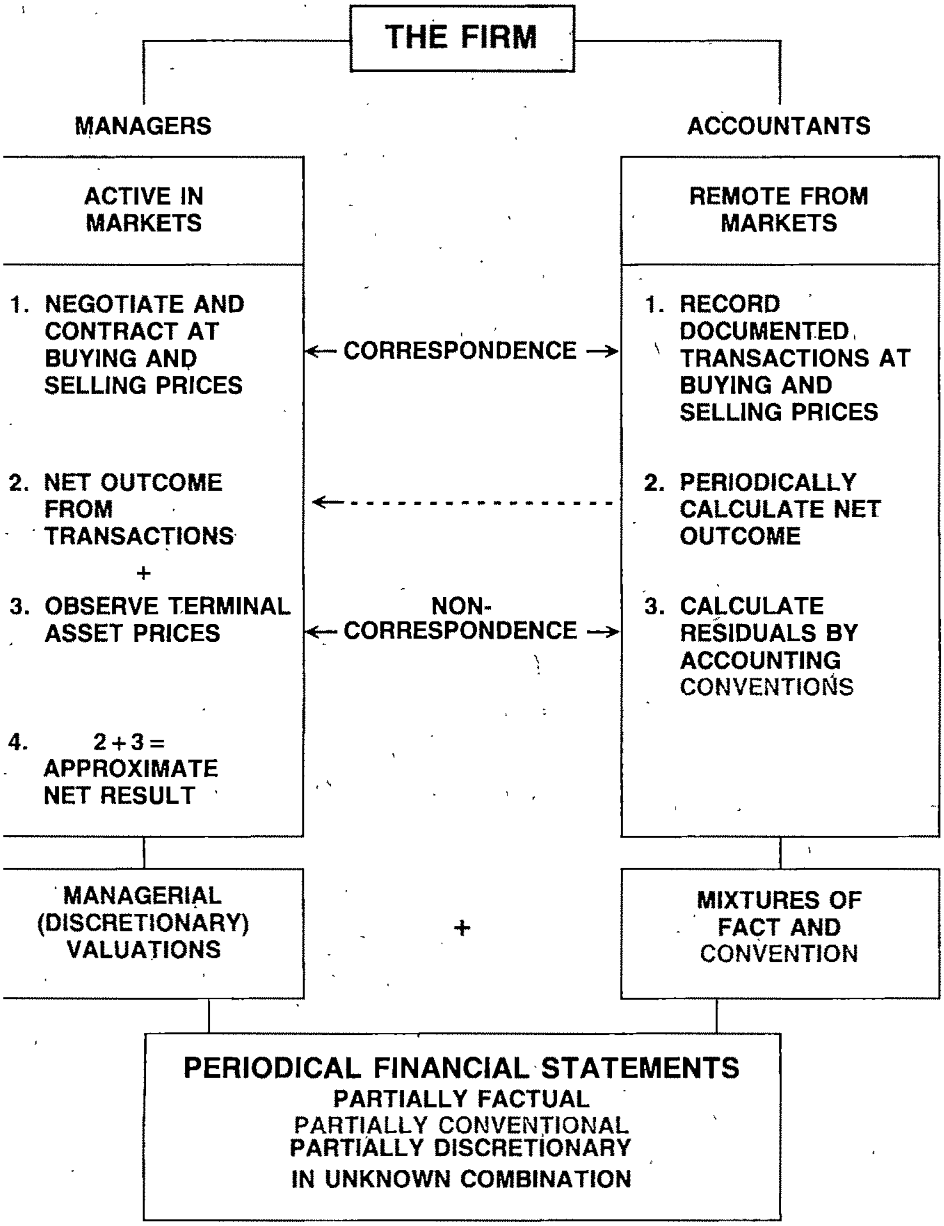
Thus, for the private conduct of privately owned business, the manager could assign eriodically whatever values he chose to assets. If his choice misled him that was his ffair; the resulting gain or loss would fall on him. Mid-nineteenth century legislation the U.K., enabling the creation of 'public' companies trading with limited liability, introduced new rules for those companies. They were to publish periodical balanc sheets, the very information about which private traders were secretive, as a *quid pr quo* for the privilege of trading with limited liability. The general purport of th legislation was that full and fair balance sheets were to be made up, and properl drawn up so as to exhibit a true and correct view of the state of company affairs Ostensibly that information was for the benefit of shareholders; potentially it coul come into the possession of creditors of and contractors with companies, and be use in ways inimical to the interests of shareholders. This interference with 'traditiona privacy would not readily be suffered.

The expectations of the legislature were at first ignored; the financial publicit provisions that were earlier in contemplation were relaxed (Hunt, 1936, pp. 138–9). Fo their part, companies and their managers could take steps to moderate the intention o the legislation. In the light of Carter's description (above) of the private ledger, i seems plausible to suppose that a general or nominal ledger might contain the complete record of periodical transactions, while the private ledger contained whatever estimates might have been made of the dated values of assets. To maintain the privacy of the private ledger, the accounts to be published might then be drawn up from the nominal ledger, where asset purchases and the balances of unsold assets would appear at their purchase prices (costs). That supposition is consistent with the thin and inconclusive treatment of asset valuation in late nineteenth-century texts, and with the assignment to management of the valuation function. Over the same period there began to appear in the literature references to secret reserves arising from the undervaluation and omission of assets and other devices (e.g., Dicksee, 1892, p. 135). The attitude of accountants and auditors toward secret reserves was ambivalent. Secret reserves made it possible to equalize dividends and equalize apparent profits (Dicksee, 1905, p. 194), but they also made possible concealment and manipulation by managers. However, a judicial opinion of 1906 condoned, if it did not actively endorse, the undervaluation of assets: 'The purpose of the balance sheet is primarily to show that the financial position of the company is at least as good as there stated, not to show that it is not or may not be better' (Buckley J, 1906).

If, then, the valuations of assets at cost or on the basis of cost understated their values in exchange, they could be said to be conservative—and that would give comfort to shareholders and creditors. Such values could be said to have been a matter of the firm's experience; although the experience may have been distant, the claim would appeal to the preference for factual over fictional information. Those values also secure to managers the tactical advantage of privacy, of relief from critical scrutiny, though by its nature that is not a merit to be openly proclaimed. If all this could be achieved by the simple act of truncating history—lopping off or keeping secret whatever may have happened to the value of unsold assets subsequent to their purchase—then why not truncate history?

The disclosure laws and regulations have in fact placed accounting and accountants in the unenviable position of having to serve three masters, whose interests have seemed to be, and have been widely portrayed as being, in conflict. The parties are 'firms and their managers', 'shareholders' and 'the rest of the world'. It is the proper function of public laws to moderate civil conflicts of interest, in this case conflict over

Fig. 3. Fact, Convention and Judgement in Accounting


THE FIRM
MANAGERS
ACCOUNTANTS
ACTIVE IN MARKETS
REMOTE FROM MARKETS
1. NEGOTIATE AND CONTRACT AT BUYING AND SELLING PRICES
← CORRESPONDENCE →
1. RECORD DOCUMENTED TRANSACTIONS AT BUYING AND SELLING PRICES
2. NET OUTCOME FROM TRANSACTIONS
+
2. PERIODICALLY CALCULATE NET OUTCOME
3. OBSERVE TERMINAL ASSET PRICES
← NON-CORRESPONDENCE →
3. CALCULATE RESIDUALS BY ACCOUNTING CONVENTIONS
4. 2+3= APPROXIMATE NET RESULT
MANAGERIAL (DISCRETIONARY) VALUATIONS
+
MIXTURES OF FACT AND CONVENTION
PERIODICAL FINANCIAL STATEMENTS
PARTIALLY FACTUAL
PARTIALLY CONVENTIONAL
PARTIALLY DISCRETIONARY
IN UNKNOWN COMBINATION

eally, recorded transactions and events and their consequences would correspond with actual observables. Recourse to accounting conventions and managerial (discretionary) valuation destroys the correspondence. The resultant is non-disclosure of the facts in the guise of disclosure.

the division of the gross proceeds of business. Complete and up-to-date informatio supplied periodically, would make possible informed reaction and negotiation. Th power to conceal, to distort the flow of information, would thwart that outcome. Th is why legislation on the U.K. pattern has expected a true and fair view to be give and legislation on the U.S. pattern has expected fair presentation in accounts of t periodical consequences of trade and commerce. But, in failing to specify what w intended by 'fair', the legislators overlooked another common propensity: 'There isn such a reasonable fellow in the world, to hear him talk. He never wants anything b what's right and fair; only when you come to settle what's right and fair, it's everythin that he wants, and nothing that you want. And that's his idea of a compromise . . . (Thomas Hughes, *Tom Brown's Schooldays*, 1857). They overlooked the alread established means of concealing what was expected to be disclosed. The conjunctio of the so-called disclosure laws with those practices is, effectively, legislative endorsement of non-disclosure. (See Fig. 3.)

TIME IN ACCOUNTING

The themes of this excursion may seem to be diverse. However, they all illustrate the tendency of unchecked temporal anomalies to undermine the fruitfulness of a potentially valuable device. An accounting, historical and factual, locked by explicit reasoning to the processes of judgment and choice, is a widely entertained ideal. But if the reasoning disregards the uniqueness of moments of choice and the irreversibility of time, the ideal is set aside—if not deliberately, then carelessly or indifferently. The false, mistaken, idea that supplants it may long command allegiance; that allegiance, crystallized into a 'tradition', may long subvert attempts to attain the ideal. The failure of decades of costly effort to eradicate the known flaws in accounting doctrine and practice should be clear evidence of their intractability. But standard-setters, regulators and teachers are unimpressed. '. . . what experience and history teach is this', said Hegel, 'that peoples and governments never have learned anything from history, or acted on principles deduced from it' (1830, p. 6). That is why folly survives. At least recourse to history may explain how things have come to be as they are.

The present products of accounting, its subsidiary processes and its justifications are anachronistic to the core. Whether the prevalent mode of accounting should survive or should be replaced by a temporally well disciplined alternative is a matter of choice by those who assume the task of advancing the functional fitness of accounting. Their predecessors have chosen the path of obfuscation in the name of disclosure.

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ABACUS, Vol. 25, No. 1, 1989

O. FINLEY GRAVES

Walter Mahlberg's Valuation Theory: An Anomaly in the Development of Inflation Accounting

Walter Mahlberg's inflation-accounting treatise of 1921, *Bilanztechnik und Bewertung bei schwankender Währung*, contains the first book-length price-level-adjustment model in the literature. As the title of the book indicates, Mahlberg treated the matter of restatement technique and the matter of asset valuation during inflation as distinct topics. Mahlberg's restatement technique was not without immediate influence in Germany and has been addressed previously in English-language publications. His valuation theory, on the other hand, had little effect on contemporary developments and remains an anomaly in the literature today. In particular, Mahlberg saw the effect of certain specific price-level changes—those whose rate of change exceeded general inflation—as giving rise to unavoidable future losses; losses, he maintained, that should be recognized currently. Since Mahlberg's theory is generally unknown outside Germany, the present paper first provides English-speaking audiences with an explication of the logic that led Mahlberg to his unique conclusion. It then argues that although Mahlberg's valuation theory represents a cul-de-sac in the development of inflation accounting itself, it ironically may have contributed to Henry Sweeney's 1936 concept of 'unrealized appreciation', which is an early conceptualization of a holding gain, net of inflation.

Key words: Accounting theory; Inflation accounting; Price level financial statements (ACC).

INTRODUCTION

Germany in the 1920s witnessed the emergence of a new business science termed *Betriebswirtschaft*, or 'the economics of the firm'. This new science encompassed not only modern microeconomics but modern management, finance and accounting as well. Indeed, many of the prime movers of the *Betriebswirtschaft* movement, including Eugen Schmalenbach, Fritz Schmidt and Walter Mahlberg, wrote primarily on accounting topics. Not a few of them, further, wrote on the matter of inflation accounting. Serious inflation had begun in Germany with the outbreak of World War I and ended only after reaching hyperinflationary proportions during 1922–3.

Indeed, the German *Betriebswirtschaftler* were the first to develop comprehensive

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The comments of Graeme Dean and Frank Clarke are gratefully acknowledged.

inflation-accounting models. Eugen Schmalenbach, the originator of dynamic balance sheet theory, perfected a price-level-adjustment model based on the use of an index as early as 1922,[1] and Fritz Schmidt, whom Schoenfeld has termed 'the undisputed senior of replacement value theory' (1979, p. 59), published the first fully-fledged current value model in 1921. A third, Walter Mahlberg's gold mark model, also dates from 1921 and like Schmalenbach's is a price-level-adjustment model. Since it preceded Schmalenbach's writings on the subject, however,[2] it represents the first of the major German price-level-adjustment models to find its way into print. Mahlberg, who had studied under Schmalenbach at Cologne and who became Professor of Economics at the University of Freiburg, originally published his model in short monograph form as *Bilanztechnik und Bewertung bei schwankender Währung*, or, in English, *Accounting Technique and Valuation During Periods of Changing Prices*. He revised and expanded the book in 1922 and again in 1923.[3]

As the title of the book indicates, Mahlberg treated the matter of restatement technique and the matter of asset valuation during periods of inflation as distinct topics. Of particular interest in the present paper is the matter of Mahlberg's valuation theory. Mahlberg's restatement technique, which called for the deflation of the depreciated German mark to its pre-World War I gold mark value, was not without immediate influence in Germany and has been described elsewhere in English (Sweeney, 1928; Graves, 1987). His valuation theory, on the other hand, had little effect on contemporary developments and is generally unfamiliar to accounting historians outside Germany. In particular, Mahlberg saw the effect of certain specific price-level changes—those whose rate of change exceeded general inflation—as giving rise to unavoidable future losses; losses, he maintained, that should be recognized currently. It was a notion that not only found little response at the time, but one that remains an anomaly in the inflation-accounting literature today.

The purpose of calling attention to Mahlberg's valuation theory in the present paper is twofold. First, since Mahlberg's theory is generally unknown to English-speaking audiences, the paper provides an English-language explication of the logic that led Mahlberg to his unique conclusion concerning unavoidable future inflationary losses. Second, the paper argues that although Mahlberg's valuation theory found few adherents at the time of its formulation, it may well have played a role in the development of Henry Sweeney's 1936 concept of 'unrealized appreciation'. Sweeney's book of that date, *Stabilized Accounting*, represents the first book-length treatment of inflation accounting in the United States, and his idea of 'appreciation' is an early conceptualization of a holding gain, net of inflation. Sweeney reported having studied Mahlberg's inflation-accounting writings in detail, and Sweeney's current cost/

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[1] That is, in *Goldmarkbilanz*. Schmalenbach's first formulation of a price-level-adjustment model had appeared the previous year in an article entitled 'Geldwertausgleich in der bilanzmässigen Erfolgsrechnung' (Schmalenbach, 1921). That model was preliminary in that Schmalenbach did not at that time commit to a particular restatement device. He also restated in terms of year-end marks rather than those of 1914 as his 1922 model required. He did, however, restate both non-monetary (*Realwerte*) and monetary (*Geldwerte*) items.

[2] Schmalenbach acknowledged the prior appearance of Mahlberg's *Bilanztechnik* in a footnote on the first page of 'Geldwertausgleich . . .' (1921, p. 401n).

[3] The following exposition of Mahlberg's theory is based on the 1923 edition. All translations from the German in this paper are the author's.

constant dollar idea of appreciation is identical to Mahlberg's concept of a 'specifi price-level premium', the difference between the current value of a good and what th good's price would have been had its value risen at the same rate as general inflatio The paper concludes, accordingly, that although Mahlberg's notion of a specific price level premium as an unavoidable loss represents a cul-de-sac in the history of inflatio accounting, his theory may have indirectly contributed to the development of modern inflation-accounting concept.

MAHLBERG'S THEORY

With regard to technique, Mahlberg's gold mark model called for the restatemen (deflation) of the depreciated German mark in published balance sheets by the amoun of the premium contained in the current price of gold, the premium, that is, as compared to the price of gold in 1914. That year had been the last year the paper mark was redeemable in gold and was the most recent pre-inflationary year. Gold, Mahlberg maintained, enjoyed a fundamental value relationship to all other goods that endured over time and at all price levels. Phenomena such as variations in production and consumption, political upheaval, and the uneven progression of general price-level change might temporarily disturb individual value relationships between gold and other goods (giving rise to specific price-level changes), but once economic, political or monetary stability returned, the original, underlying value relationships inevitably re-established themselves.

If the price of one gram of gold was three marks in 1914, for example, and the same three marks would buy one kilogram of coffee, then one kilogram of coffee was essentially worth one gram of gold. The particular relationship might become obscured when the value of the mark itself was in flux, but once the value of the mark stabilized again, the original relationship would reassert itself and one kilogram of coffee would again clearly be worth one gram of gold. The price of gold, therefore, was in Mahlberg's view the most stable measure of value available, and the current premium on gold the most sensitive measure of price-level change.

The fundamental value relationship Mahlberg perceived between gold and other goods represents the first of two assumptions underlying his valuation model. A crucial ramification of this assumption for his theory was that if the price of a particular good such as coffee rose faster than the price of gold (the price of gold representing the general price level), the price of coffee would contain a temporary premium (*Überpreis*) that was the difference between its current cost and what its cost would have been had its price risen at the same rate as the price of gold. The premium, however, was necessarily transitory. For once price-level stability returned, the value relationship between coffee and gold would reassert itself, and the price of coffee would fall to accord with the newly stabilized general price level. If, on the other hand, the price of coffee rose more slowly than the general price level, its price would contain a temporary discount (*Unterpreis*) that would also necessarily disappear when prices stabilized generally.

The second assumption underlying Mahlberg's valuation theory concerned the effect of inflation on the management of a firm. During periods of inflation, Mahlberg ontended, every firm, willy-nilly, was engaged in a grandiose monetary speculation on hose success the life of the firm depended. Indeed, according to Mahlberg, profits uring inflation became primarily a function of a manager's ability to manage onetary items astutely and only secondarily of his ability to manage normal perations. As a result, the purpose of income determination during inflation became ot to measure the results of the normal operating efficiency of a firm as chmalenbach had contended,[4] but the results of the overriding monetary speculation which the firm found itself engaged.

On the basis of these two assumptions, Mahlberg argued that on any balance sheet ate two types of inflationary gains and losses lay in a firm's future and affected aluation in the balance sheet as of the current date. These gains and losses related to he nature of assets held and included both avoidable gains and losses and unavoidble gains and losses. Avoidable gains and losses were those associated with the olding of monetary items and of non-monetary items not essential to the operations f the firm.[5] The holding of both these kinds of items during inflation, Mahlberg rgued, was inherently speculative, and gains and losses were certain to be incurred on hem as their value changed from period to period. Their composition, however, was ntirely at the discretion of the manager of a firm and if the manager were astute nough, all losses on such items could be completely avoided. Losses on the extension f credit, for example, could be hedged by incurring debt in an amount equal to or reater than the credit granted. Losses on non-monetary items not necessary to the peration of the firm could be avoided by choosing not to hold such items or by hoosing carefully among the items held. What was important with respect to the aluation of these items was that the results of having held them during the period ould be measured and a point of comparison would simultaneously be provided for easuring the results of their being held during the succeeding period. Such results ere best measured when the gold-mark equivalent of the current paper-mark value of ese items was entered in the balance sheet. The change in their gold mark value from eriod to period then measured the speculative gain or loss for the periods involved.

With regard to Mahlberg's general understanding of the term 'current value' *Tageswert, Tagespapierwert, Tagespreis*), he apparently considered the current value f inventory and working plant and equipment as their current replacement cost. In is monograph *Der Tageswert in der Bilanz* of 1925, for example, in which he rovided numerical comparisons of his own gold mark model with Fritz Schmidt's urrent value model, he recorded the current value of inventory (for purposes of estatement in terms of gold) at the same current replacement cost as Schmidt Mahlberg, 1925, pp. 6–7, 17). In a discussion of possible depreciation bases in the ame monograph, however, he did take note of Schmalenbach's distinction between a iece of equipment's current reproduction cost and its fair market value, identifying he latter as an asset's current value when the two values differed (Mahlberg, 1925,

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According to Schmalenbach (1925, p. 81), the very purpose of periodic income determination was early detection of incipient change in the operating efficiency of a firm, which, in turn, allowed timely corrective action on the part of the proprietor.

The concept of what constitutes items 'essential to the operation of the firm' has been the subject of much discussion in the Anglo-American accounting literature (see Burgert, 1972, and Ashton, 1981).

p. 49). In the case of non-monetary assets held for speculative purposes (other tha inventory), Mahlberg apparently equated current value quite straightforwardly wit fair market value. He did so explicitly in the example which follows of the building, i which he referred to the building's current value as *Tageswert* (current value) an *Marktpreis* (market price) successively (Mahlberg, 1923, pp. 170–1). If the period ended market value of a building held as an investment were M10,000 and the price o gold had risen tenfold during the period, the building would be valued at 100,000 gol marks in the balance sheet. That value would then be compared with the building' gold mark value at the end of the previous period to determine if any gain or loss o the investment had occurred.

Unavoidable gains and losses were those associated with the holding of workin plant and equipment and with the maintenance of a base stock. A base stock Mahlberg explained, was like a fixed asset in that a firm generally always had to hav on hand that minimum level of inventory necessary to continue in business. Also unlike avoidable gains and losses (whose occurrence was entirely contingent on futur price-level changes), unavoidable gains and losses resulted from price-level change that had already taken place.

Most unavoidable losses, Mahlberg emphasized, occurred in conjunction with th maintenance of a base stock rather than with the holding of plant and equipment. This was true because a base stock never ceased to turn over. During periods of price-level change, accordingly, firms not infrequently found themselves in the position of having to pay a specific price-level premium in order to maintain its base stock and continue to exist. But payment of a specific price-level premium on the turnover of a base stock necessarily entailed a loss at some point in the future. This followed because sooner or later, when the general price level stabilized, the goods that constituted the firm's base stock would resume their normal value relationship to other goods, and both their cost and sales price would begin to fall. When the value of the goods began to fall, however, the firm would be forced to sell items from its base stock at prices lower than it paid for them, giving rise to a loss.

Having argued that such losses were inevitable, Mahlberg addressed the question as to when the losses should be recognized. The choices as he saw them were either when the premium was paid or in some subsequent period when the losses actually occurred. To answer the question, Mahlberg referred to his assumption that during periods of inflation the success of a firm depended more on inflationary gains and losses than on profits from operations. This being the case, he recommended that the losses be recognized currently since '[b]y eliminating the loss now, we clear the way to measure the effects of further price-level change on the firm' (1923, p. 177).

In keeping with this principle, Mahlberg contended that base stocks should be valued net of any specific price-level premiums or discounts. As a result, rather than reduce the current paper-mark cost of a base stock directly to its gold mark value, he first eliminated any specific price-level premium or discount to arrive at what he termed the base stock's 'programmed' or 'scheduled' value (*planmässiger*, *etatsmässiger Wert*), its normal value relative to other goods at the currently prevailing price level. Only then did he restate the inventory in terms of gold. If the paper-mark value of a base stock had increased twenty fold, for example, while the general price level had sen only tenfold, the restatement procedure according to Mahlberg would appear as Table 1, where the assumed M1,600 paper value of the inventory or base stock is duced by 10/20 (800 marks) for the specific price-level premium before being duced another 9/10 for inflation. And since Mahlberg commingled actual monetary ains and losses with restatement amounts in the profit-and-loss account,[6] the result of ahlberg's procedure is an inventory-related debit to profit-and-loss of M1,520 mpared with only M1,440 (9/10 of M1,600).

As to working plant and equipment, Mahlberg noted that although it was subject to e same valuation principles as a base stock, few gains or losses actually resulted from ecific price-level premiums or discounts contained in its current paper-mark cost.

TABLE 1

INITIAL GOLD-MARK BALANCE SHEET SHOWING ELIMINATION OF SPECIFIC PRICE-LEVEL PREMIUM ON BASE STOCK

Balance sheet

achinery		100	Capital		200
ventory	1,600		Accounts payable	1,000	
Less 10/20 for specific price-level premium	800		Less 9/10 for inflation	900	100
	800				
Less 9/10 for inflation	720	80			
oss		120			
		300			300

urce: Mahlberg, 1923, p. 172.

his was true, he maintained, because most fixed assets currently in service antedated e current inflation and no doubt would continue in service well beyond the close of flation. Few, accordingly, were likely to be replaced while a specific price-level remium was in effect. As a rule, then, the pre-war, historical cost value of a fixed sset—its gold mark value—could simply be carried forward from period to period uring the inflationary months. Only if it became apparent shortly before the actual placement of a fixed asset that its current replacement cost differed from its rogrammed value should a gain or loss be recognized as a result of a specific pricevel premium or discount.

CONCLUSION

he fact that Mahlberg's valuation theory met with little response at the time of its ublication is borne out by the lack of support accorded it in the contemporary terature. For his part, Fritz Schmidt suggested that Mahlberg's idea of adjusting to a ood's 'scheduled' value before restatement to gold opened the door to considerable rbitrariness. He also questioned the certainty of the future losses Mahlberg foresaw,

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For an account of Mahlberg's procedures in this regard, see Graves, 1987, pp. 39–40.

and thus the wisdom of recognizing them currently (1924, pp. 65–8). Schmalenbach, on the other hand, questioned the use of the price of gold as a measure of general price-level change. The value of gold, he contended (1922, p. 36), was itself unstable and tended to fluctuate with supply and demand as well as with political events. Its current price, accordingly, did not provide a sufficiently reliable measure of general inflation for price-level-adjustment purposes.

Yet, as mentioned at the outset of this paper, Mahlberg was not without immediate influence on contemporary inflation-accounting developments. For although indexation became the most widely accepted method of price-level adjustment in the literature, restatement generally was to the mark's pre-war, 1914 value, as Mahlberg had recommended. Indeed, the term 'gold mark accounting' soon became synonymous with price-level-adjustment accounting in general and very closely associated with indexation. Mahlberg also exerted considerable influence on Henry Sweeney and his inflation-accounting treatise, *Stabilized Accounting*, of 1936. Sweeney read the works of Schmalenbach, Schmidt and Mahlberg in the mid-1920s (Sweeney, 1927) and apparently particularly admired Mahlberg. He described Mahlberg's gold-mark technique in some detail in a 1928 article entitled 'German Inflation Accounting' and stated in a 1964 essay on the origins of *Stabilized Accounting*[7] that 'the most logical, clear, complete, and practical [of the German treatises] was, by far, the book entitled "Bilanztechnik und Bewertung bei schwankender Waehrung" . . . by Professor Dr Walter Mahlberg of the University of Freiburg at Breisgau' (p. xxi).

Perhaps what most attracted Sweeney was Mahlberg's clearly articulated general purchasing-power capital maintenance position. For, while Sweeney's capital maintenance position accords in every respect with Mahlberg's (cf. Mahlberg, 1923, p. 13 and Sweeney, 1964, p. 4), the price-level-adjustment model contained in *Stabilized Accounting* more closely resembled Schmalenbach's.[8] Like Schmalenbach, Sweeney recommended the use of indexation for restatement purposes and applied the index he chose to the historical cost of the items restated. (Unlike Schmalenbach, who adopted Mahlberg's technique of restating the value of money to 1914, Sweeney preferred to restate for value-of-money changes in terms of its period-end value. See Sweeney, 1964, p. 38.)

Sweeney's indexation model, however, is only one of two inflation-accounting models contained in *Stabilized Accounting*. A second model, one Sweeney termed 'still more informative than stabilization based on original cost' (1964, p. 44), but considered impracticable, superimposed Schmalenbachian indexation on what is essentially Schmidt's current value model. (Sweeney had carried on an extended correspondence with Schmidt concerning replacement cost accounting and referred to Schmidt in connection with the model in question in his book [1964, p. 47n].[9] He also rived at current replacement costs using individual price indexes as Schmidt had commended in his *Organishce Bilanz Bilanz*) The result is the first current cost/nstant dollar model in the literature.[10]

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[7] Sweeney prepared the essay as a new introduction for the 1964 reprint edition of the book.

[8] In regard to Sweeney's capital maintenance position, he in principle adopted the purchasing power capital maintenance of the British economist, Alfred Marshall (Sweeney, 1964, p. 4n). Mahlberg's position is entirely consistent with Marshall's. Seicht (1970, p. 413) described Schmalenbach as 'the father of indexation' (as cited in Clarke and Dean, 1986, p. 69).

[9] In his 1936 classic Sweeney also had high praise for Schmidt, referring to him as 'the German authority on stabilized accounting' (p. 40). Recently Clarke and Dean (1988) have suggested that it was Schmidt not Mahlberg who had a greater influence on Sweeney's post 1928 writings.

One particular concept that Sweeney discussed in connection with that model was nrealized appreciation'. Sweeney explained the concept as follows:

> When the price of an asset rises at a faster rate than does the general index, the value that money has with reference to this special article falls more than it does with reference to goods and services in general. A profit may then be said to have taken place as the result of a greater change in the special value of money than in the general value of money. (1964, p. 18)

ecause Sweeney's appreciation represented profit only to the extent that the special lue of an asset exceeded its stabilized or price-level-adjusted value, it constitutes an rly conceptualization of a holding gain, net of inflation. The difference that gave rise Sweeney's appreciation, however—the difference between the current value of an set and its price-level-adjusted value—is the same that gave rise to Mahlberg's ncept of a specific price-level premium. Indeed, although Sweeney saw a gain where ahlberg saw a loss, given Sweeney's familiarity with Mahlberg's model, Mahlberg ay well have provided Sweeney with the current cost/constant dollar insight that led his idea of unrealized appreciation. Certainly neither Schmalenbach nor Schmidt counted for the difference. In sum, then, although Mahlberg's valuation theory has mained an anomaly in the inflation-accounting literature, it perhaps provided the sis for the first conception of a holding gain, net of inflation.

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BACUS, Vol. 25, No. 1, 1989

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The Use of a Statement of Changes in Financial Position to Interpret Financial Data: An Empirical Investigation

This study provides empirical evidence on the use of a statement of changes in financial position by financial analysts to interpret and make judgments on information contained in annual reports. Analysts were required to answer five questions developed from claims made in a professional accounting standard about the purpose of the statement of changes in financial position. The results indicate that the statement of changes in financial position does not generally enhance financial analysis.

Key words: Financial reporting; Financial statement analysis; Funds statements.

lany professional accounting associations require the presentation of a statement of ianges in financial position (SOCIFP) as an integral part of the financial statements.[1] his study reports an experiment investigating the use of a SOCIFP by financial ialysts in the context of a loan decision. It is timely in that accounting policy makers e currently considering the replacement of the SOCIFP with a cash flow statement. or example, in Australia the Accounting Standards Review Board is reviewing AAS 2. On the other hand the Financial Accounting Standards Board in the U.S.A. and ie New Zealand Society of Accountants have already issued standards which require cash flow statement.[2] However, cash flow statements have not been universally cepted as superior to the SOCIFP (e.g., Jamieson, 1988).

BACKGROUND

lthough the usefulness of the SOCIFP has been debated for a number of years, little npirical evidence exists to support competing claims. Capital market studies have ot found a significant relationship between security prices and 'funds from operations' .g., Beaver and Dukes, 1972; Patell and Kaplan, 1977; Harmon, 1984). This, owever, does not preclude the usefulness of a SOCIFP in the credit market, as loan

Australia: Technical Bulletin F1; Canada: CICA Handbook S1540; U.K.: SSAP 10; International Accounting Standard 7.

USA: FASB; NZ: SSAP 10 (1987).

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officers use financial statements (in conjunction with other information) to assess t ability of loan applicants to repay (Eyes and Tabb, 1978; Zimmer, 1981).

Studies in which analysts have ranked the perceived importance of financi statement items provide evidence consistent with fund statements being viewed important (Rakes and Shenkir, 1972; Chandra, 1974; Busby, 1975; Firth, 197 McNally, Eng and Hasseldine, 1982). On the other hand, Pankoff and Virgil (197 found that analysts assess 'cash flow from operations' in the set of least importa information items. In a laboratory experiment, Walker (1984) found that the inclusio of a SOCIFP in annual reports did not enhance the interpretability of financi statements.

The experimental design of this study is similar to Walker's of 1984. However, the are three important differences. First, Walker developed his test questions from t 'funds statement' literature. The focus of this study is more specific and test questio were developed from the reporting objectives of a SOCIFP as stated in professiona accounting standard, SSAP 10 (1979).[3] A second major difference is that Walke analysed his results on the basis of whether a SOCIFP was included in the test set o financial statements. In this study the analysis is conducted on the actual usage o SOCIFP. A third difference is that Walker limited his concern to the usefulness of th SOCIFP in the 're-packaging' of financial data provided elsewhere in the financia statements. This study examines whether analysts can use the SOCIFP to acces information not directly provided in the balance sheet and income statement.

This experiment involved observing the use of a SOCIFP by thirty financial analysts in answering five questions. Two questions involved judgments of a firm's financial position and prospects, and three questions involved calculations about the firm's investing and financing activities. The test questions were specifically designed from the stated use of a SOCIFP in SSAP 10 (1979), which describes the SOCIFP as an 'integral part of the financial statements and is complementary to the profit and loss account and balance sheet. It presents information which may not be readily available in the other statements' (para. 3.1). If this claim were accurate then it could be expected that financial analysts would make use of the SOCIFP to shorten the time spent analysing investment and finance transactions. Furthermore, if analysts using a SOCIFP were more accurate (or reached greater consensus) or had greater confidence in their analysis, then it could also be claimed that a SOCIFP enhances financial statement analysis.

METHOD

Research Instrument

Each analyst was given an identical annual report accompanied by five questions. The annual report was based on an actual report of a small New Zealand manufacturing company (total assets $9.6 million). The report contained the following sections: Chairman's Review, Directors' Report, Income Statement, Balance Sheet, Notes to

[3] The New Zealand standard is an 'all financial resources' statement based on a 'working capital' concept of funds, and is therefore similar to the SOCIFP required by other professional associations (see note 1). The standard has been superseded by SSAP 10 (1987), Statement of Cash Flows.

he Financial Statements, SOCIFP, Auditors' Report and a Five-Year Comparative eview. The annual report complied with the requirements of SSAP 10 and closely ollowed the example presented in the Appendix to SSAP 10 (1979).

The concern of this study is whether the SOCIFP, as prescribed by SSAP 10 (1979), nhances financial statement analysis. According to SSAP 10 (1979), the objective of he SOCIFP is to 'summarize the financing and investing activities of the entity' (para. .2). To meet this objective SSAP 10 (1979) requires the SOCIFP to 'show what dditional funds were provided during the period from operations and from other ources, and how these funds were applied to dividends, increases in the investment in ssets, and reductions and redemptions of liabilities and capital' (para. 3.2).

TABLE 1

MEAN RELATIVE TIME SPENT PER QUESTION

	Question[a] 1 %	2 %	3 %	4 %	5 %
hairman's review	15.7	18.7	0.0	0.0	0.6
irectors' review	4.9	5.6	0.0	0.0	0.2
ncome statement	13.2	13.7	1.7	1.2	1.5
alance sheet	25.3	16.9	50.6	36.9	30.1
otes	21.1	9.4	7.0	25.5	42.1
OCIFP	5.3	5.0	27.8	30.9	22.2
uditors' report	1.6	0.0	0.5	0.0	0.2
ive-year review	12.9	30.9	12.4	5.5	0.6
ean total time per nalyst (in seconds)	562.0	56.4	83.8	69.5	96.2
umber of analysts not sing the SOCIFP	8	22	9	6	6

The research questions were as follows:

udgment Questions:

Is the company likely to default in repayment of the specified loan during the normal course of business?

Is it likely that the company will pay a dividend next year?

alculation Questions:

he source of the correct answers for the calculation questions in parenthesis)

By what amount has the working capital position changed over the year?
(Balance sheet, SOCIFP, five-year review)

State the amount of liabilities repaid during the year
(Balance sheet, SOCIFP)

State the amount of fixed assets purchased during the year
(SOCIFP)

For each analyst a record was made of the time spent examining each section of the nnual report in answering each question. The answers to judgment questions were ecorded on a five-point scale from 1 ('Very likely') to 5 ('Very unlikely'). Calculation uestions could be answered by direct reference to the financial statements and were raded according to their accuracy. Respondents were asked to indicate their conidence in each answer on a five-point scale. The five questions and the location of nformation to answer the calculation questions are reported in Table 1.

Question 1 concerned a proposal to refinance a five-year second-ranking debenture of $100,000. Analysts were asked to predict the likelihood of default.[4] The questio allowed analysts to familiarize themselves with the information available in the annua report. The company had recorded modest profits in the current year, after incurrin losses in the previous three years. Hence the prediction of default would requir careful analysis.

While question 1 is not directly related to the purposes of a SOCIFP, as expresse in SSAP 10 (1979), it provides some evidence of the use of SOCIFP within a credi decision context. Since analysts were not provided with cash flow forecasts, recours to the SOCIFP might be expected if analysts were searching for information on th flow of funds and the ability to service principal and interest commitments.

The remaining questions dealt with examples of financing and investing activitie described in SSAP 10 (1979): dividends, the change in working capital, the repaymen of debt, and the purchase of fixed assets.

Question 2 (concerning dividend reinstatement) required a judgment about the firm's position and future prospects. The concern in questions 3 and 4 was the ability of the SOCIFP to enhance financial analysis by repackaging financial data 'not readily available' in the other financial statements.

As well as repackaging information, the SOCIFP also reports financial data not provided in other financial statements. For example, an analysis of succeeding balance sheets will only reveal net movements in fixed assets. SSAP 10 (1979) requires disclosure of acquisitions and disposals of fixed assets (para. 3.5) and states that the netting of items should be kept to a minimum as this tends to mask the significance of individual figures. Ryan (1987, p. 194) reports that in 1986, 46 per cent of the top 100 companies disclosed total flows rather than net changes.[5] Question 5 of our study tested whether analysts used the additional information provided by a SOCIFP.

The use of a single set of accounts raises an external validity problem: that of generalizing beyond the specific financial statement used in the study. On debriefing, analysts confirmed that the annual report used in this study was broadly typical in content and format of annual reports of the small to medium sized companies listed on the New Zealand Stock Exchange. Furthermore, Walker (1984) found that by administering six sets of accounts to each subject there was some 'learning' of the experimental task. It was anticipated that even with a single annual report, respondents could answer the last question more quickly than the first. Question 1 was asked first in all cases. This general question allowed analysts to become better acquainted with the data available in the annual report. To overcome any bias due to 'learning', the order of the four subsequent (financing and investing) questions was randomized.

Procedure

Each financial analyst was given the research instrument in their usual office or workplace and completed the questionnaire in the presence of the researcher. The time spent by respondents in reviewing each section of the annual report was recorded.

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[4] The primary purpose of financial analysis by loan officers is to predict loan default, rather than assess the maximum amount to be loaned (Wilkins and Zimmer, 1984).

[5] Similar reporting procedures also exist in Australia. See Ryan, Heazlewood and Andrew (1980).

On debriefing, nearly all analysts admitted they felt under some time pressure to nish the questionnaire. However, several analysts suggested that such time pressures xist in their normal working environment. Furthermore, time pressure may accentuate cue-focusing strategy. This would increase the weighting (relative time) spent on the ıost important cues (sections of the annual report).

ubjects

hirty financial analysts from eleven organizations participated in the study. The nalysts varied in age, length of experience, rank and qualifications (twenty of the nalysts had a degree in accounting). The years of commercial experience accumulated y the analysts ranged from one to thirty years, with a mean of eleven years. This ample can be regarded as a sophisticated user group.

RESULTS

able 1 provides a summary of the analysts' use of the SOCIFP. The mean time spent y users of SOCIFP in answering question 1 was 638 seconds compared to 354 econds for the eight non-users. However, much of this extra time was spent analysing on-SOCIFP data as the mean time spent on the SOCIFP was only forty seconds. nly eight respondents used the SOCIFP when assessing the likelihood of a dividend ayment in the following year. Users of SOCIFP took an average forty seconds longer ı reviewing data for question 2, of which only ten seconds were spent on the SOCIFP self. Contrary to the stated objectives of SSAP 10, the SOCIFP was not the prime ource of information used by analysts when considering investing and financing ansactions (questions 2 to 5).

The relative time spent reviewing the SOCIFP was measured by the ratio of time pent reviewing the SOCIFP, over the total time spent analysing all sources of ıformation provided in the annual report. A relative time ratio of one indicates that ıe SOCIFP was the single information source in the annual report used to answer a uestion. Hence, the relative time ratio reflects the importance or contribution of the OCIFP to each question.[6] Table 2 presents Spearman correlations between relative ime and the variables: total time, accuracy (or consensus) and confidence.

udgment Questions

uestions 1 and 2 required analysts to form judgments on the future prospects of the rm with regard to loan default and dividend reinstatement. The relative time spent sing the SOCIFP is uncorrelated to total time spent on the analysis and to the quality r confidence of answers. This result indicates that the SOCIFP does not enhance nancial analysis involving judgments.

alculation Questions

uestions 3 and 4 concerned the repackaging of information contained elsewhere in

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The use/non-use or the length of time spent on the SOCIFP were discarded because they might not differentiate between good or weak analysts.

the financial statements. Question 3 involved interpretation of the concept of ‘workin capital’ used in the balance sheet and the concept of ‘funds’ used in SOCIFP. significantly strong inverse correlation exists between the relative time spent dete mining working capital and the total time for the analysis. However, all analys answered question 3 correctly and the correlation between the relative time an confidence was not significant.

Question 4 required analysts to calculate the amount of liabilities repaid. To answe this correctly, the respondents should have summed the changes in term liabilitie ($126,000 decrease) and the current portion of term liabilities ($99,000 increase). Th most common answer (from twenty analysts) was $126,000; only five gave the correc answer of $27,000. The correlations between relative time and total time, an accuracy, were not significant.[7]

TABLE 2

CORRELATIONS BETWEEN RELATIVE TIME SPENT ANALYSING SOCIFP

	Total time spent	Accuracy or consensus	Confidence
1 Default assessment	0.283	0.207	−0.053
	(0.129)	(0.272)	(0.780)
2 Dividend forecast	0.236	0.044	0.073
	(0.246)	(0.831)	(0.725)
3 Working capital	−0.553	0.000	−0.032
	(0.002)	(1.000)	(0.867)
4 Liabilities	−0.054	0.061	0.127
	(0.778)	(0.748)	(0.504)
5 Fixed assets	−0.795	0.486	0.413
	(0.000)	(0.007)	(0.023)

Note: Significance levels are shown in parentheses.

The results in Table 2 indicate that the SOCIFP does not unequivocally enhance financial analysis by repackaging information that is available elsewhere in the financial statements. Clearly the treatment of the current portion of the term liability is a major problem of interpretation for most analysts—a problem which is not solved by the disclosure and use of a SOCIFP.

Question 5 examined whether analysts could use the additional information provided in the SOCIFP on the purchase of fixed assets. Significant correlations indicate that the SOCIFP reduces total time, and increases accuracy and confidence in analysts' answers. However, care must be taken in interpreting these results as question 5 could only be answered by using the SOCIFP. Further analysis showed that the correlation between relative time and commercial experience (in years) of analysts was 0.30 and significant (at the 0.05 level). This indicates that the more experienced analysts knew that additional data on fixed assets is provided by the SOCIFP and were able to utilize this information.

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[7] Analysts confirmed, on debriefing, that test questions were unambiguous. Hence any wrong answers relate to the inability of analysts to correctly use the information provided.

SUMMARY AND CONCLUSIONS

The proposition that the SOCIFP enhances the interpretability of annual reports was restated as hypotheses that the use of SOCIFP by analysts will (a) reduce the time taken in forming judgments about investing and financing transactions, and (b) increase the accuracy (or consensus) of analysts' answers and will increase analysts' confidence in their assessments.

The use of the SOCIFP was not found to enhance analysts' judgments with regard to forecasting loan default and dividend reinstatement. The use of the SOCIFP was found to reduce the time spent in calculating the change in working capital. However, it is doubtful whether a reduction in the time spent on analysis is an important criterion. A few additional minutes spent on financial analysis, which is only part of an analyst's daily task, is unlikely to be significant. More important criteria are the quality of analysts' judgments and the confidence in those judgments. Analysts were not able to calculate the amount of term liabilities repaid. This result suggests that, contrary to the view expressed in accounting standards, a SOCIFP is not useful for this purpose. On the other hand, more experienced analysts were able to utilize the additional information on fixed assets provided by the SOCIFP.

Our interpretation of the above results is that the SOCIFP does not enhance financial statement analysis. This result is consistent with Walker (1984). Whether financial statements would be more readily interpreted with a funds flow statement prepared under a different concept of funds (e.g., a cash flow statement) was not addressed in this study. However, the evidence presented here indicates that there is little point in retaining the SOCIFP as a third financial statement.

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ABACUS, Vol. 25, No. 1, 1989

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The Effects of State Risk and Controllability Filters on Compensation Contract and Effort Choice

Surveys of business firms in the U.S.A. indicate that standard-based compensation contracts are common in practice. Analytical studies of this form of contract have suggested that under conditions of state risk, an employee's contract and effort choice are significantly affected by how pay relates to measured performance, and whether the compensation contract filters out the effects on measured performance of factors beyond the employee's control. This paper reports the results of a laboratory experiment indicating that in the presence of state risk, an individual's choice of compensation contract depends jointly on these two contract attributes and his/her risk preference as well as performance capability. The findings also indicate that actual effort is a function of the realized state, the presence/absence of a controllability filter, and the level at which the individual had expected to perform at the time of his/her contract selection. When an adverse state was realized, subjects without a controllability filter still exerted the level of effort that they had expected at contract selection, even though their marginal return to effort had been substantially reduced. On the other hand, when the controllability filter was absent, subjects who had a favourable realized state increased their effort in response to the increased marginal return to effort.

Key words: Compensation; Employment contracts; Performance evaluation.

Two major challenges facing managers of organizations are attracting employees with the desired job-related attributes, and motivating those employees to maximize performance. A key determinant of an organization's success in meeting these challenges is the type of compensation contract that it offers. Surveys of business firms in the U.S.A. indicate that standard-based compensation contracts are commonly used (Mruk and Giardina, 1985; Fox and Peck, 1986). Analytical and empirical studies of such contracts have suggested that they can affect both the types of individuals attracted to an organization and their job performance. Demski and Feltham (1978) demonstrate that employee preference for performance-contingent compensation contracts can induce employee self-selection based on performance-related skill. This analytical result has been supported in experimental studies by Chow (1983) and Waller and Chow (1985). Analytical studies have also shown that

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employee contract choice and effort (hence performance) are affected by the extent t which measured performance is subject to the influence of non-controllable factors, o state risk (Demski, 1976; Demski and Feltham, 1978; Baiman, 1982; Namazi, 1985) However, this latter proposition has not been subject to extensive empirical investigation.

This study uses the controlled setting of a laboratory experiment to investigat empirically the effects of state risk and controllability filters on employee contrac choice and performance. Such an exploration is potentially useful because employment relationships typically occur under conditions of state risk, and because th highly restrictive assumptions that typify analytical studies (e.g., homogeneous beliefs and the primacy of monetary motivation) make it desirable to subject their conclusions to empirical testing (Baiman, 1982; Demski and Kreps, 1982).[1]

REVIEW OF RELATED STUDIES AND HYPOTHESIS DEVELOPMENT

Analytical studies have suggested that when performance is subject to the influence of non-controllable factors (or state risk), an individual's choice of compensation contract is a function of his/her risk preference, performance capability, and whether measured performance is subject to the effects of factors beyond the individual's control (Demski, 1976; Demski and Feltham, 1978; Baiman, 1982). For example, Demski and Feltham (1978) compared three contract forms: a linear contract without an explicit performance standard (e.g., fixed pay, piece-rate), and two standard-based contracts—a 'bang–bang' contract, which pays a high amount for above-standard performance, a low amount otherwise; and a 'dichotomous' contract, which pays a fixed amount for above-standard performance, and an amount equal to that under the linear contract if performance is below standard. Demski and Feltham showed that when employees are risk averse, measured performance is subject to state risk, and it is costly or impossible to observe employee effort or the state, an employer can improve his/her welfare by using a standard-based contract to induce employee self-selection based on performance capability. Their analytical results also suggest that an employee's choice of work effort is a function of his/her pay contract.

To further see the nature of the motivational effects predicted by prior analytical research, consider the following example. Assume that there are two types of workers: ones with low or high performance capability (types l and h, respectively); and two forms of pay contracts: F, which pays \$45 regardless of performance (a form of linear contract), and S, which pays \$100 if performance exceeds a standard and \$0 otherwise (a 'bang–bang' contract). Each worker can exert either a low (e_l) or high (e_h) level of work effort. Finally, both types of workers are expected utility maximizers and have the same separable utility function for pay and effort, with disutilities of 10 and 20, respectively, for the low and high effort levels.[2]

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[1] Both Baiman (1982) and Demski and Kreps (1982) emphasize that the analytical literature is characterized by highly restrictive assumptions. Demski and Kreps (pp. 140–1) further note the need for careful empirical tests of the results of the analytical studies, and suggest experiments as a means of conducting such tests.

[2] The separable form of utility function is commonly assumed in the analytical research in this area (e.g., Christensen, 1982; Magee, 1980). See Namazi (1985) for a review of this literature.

First consider the case where a controllability filter is present, such that a worker's neasured performance is solely determined by his/her effort.[3] Assume that under pay ontract S, the performance standard is set at such a high level that it is impossible for low performer to attain regardless of his/her effort level (i.e., $P_l(x>s|e_l) = P_l(x>s|e_h)$ 0.0), where x = actual performance as measured, s = standard level, and P_i = probbility for worker type i ($i = l, h$). For a high performer, the standard is also nattainable with a low level of effort (i.e., $P_h(x>s|e_l) = 0.0$), but attainable for certain ith a high level of effort (i.e., $P_h(x>s|e_h) = 1.0$). When faced with the choice between hese two contracts, a high performer would select contract *S and* a high level of effort, hile a low performer would select contract *F and* a low level of effort. These results ould hold regardless of whether a worker is risk neutral ($U(\$m) = m$) or risk averse $U(\$m) = m^{0.50}$).[4]

When a controllability filter is absent, a worker's measured performance would epend not only on his/her effort, but also on the realized state. For any given level of orker effort, an unfavourable realized state would decrease measured performance elative to the standard, while a favourable realized state would increase measured erformance. Hence, when a controllability filter is absent, the standard under ontract S may become attainable to a low performer due to the realization of a avourable state, with the probability of this occurrence being higher for a higher level f effort. To reflect this situation, assume that $P_l(x>s|e_l) = 0.2$ and $P_l(x>s|e_h) = 0.3$. In imilar fashion, a favourable realized state can make the standard attainable to a high erformer for a low level of effort, while an unfavourable realized state can cause the tandard not to be attained even if the high performer had exerted a high level of ffort. This situation faced by the high performer is reflected in the assumption that $_h(x>s|e_l) = 0.6$ and $P_h(x>s|e_h) = 0.8$. When faced with the choice between contracts S nd F under these changed conditions, a risk neutral high performer would select ontract *S and* plan to exert a high level of effort, while a risk neutral low performer ould select contract *F and* plan to exert a low level of effort. Note that these choices re unchanged from the case of a controllability filter being present. But if the workers re risk averse, then *both* high and low performers would select contract *F and* plan to xert a low level of effort.[5]

The preceding example has illustrated how the presence/absence of state risk (via he presence/absence of a controllability filter), employee risk aversion, and employee erformance capability may affect employees' contract and effort choice. These redicted effects have received some support from experimental research. Chow

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Examples of controllability filters include the use of flexible budgets to control for the effects of variations in volume, and explicitly estimating the effects of non-controllable events (e.g., weather, interest rates) on performance.

For the high performer with $U(\$m) = m$, $E(U|S, e_h) = 80 > E(U|F, e_l) = 35 > E(U|F, e_h) = 25 > E(U|S, e_l) = -10$; the same ordering holds for $U(\$m) = (40m)^{0.5}$. For the low performer with $U(\$m) = m$, $E(U|F, e_l) = 35 > E(U|F, e_h) = 25 > E(U|S, e_l) = -10 > E(U|S, e_h) = -20$; the same ordering holds for $U(\$m) = (40m)^{0.5}$.

For the high performer with $U(\$m) = m$, $E(U|S, e_h) = 60 > E(U|S, e_l) = 50 > E(U|F, e_l) = 35 > E(U|F, e_h) = 25$. For the low performer with $U(\$m) = m$, $E(U|F, e_l) = 35 > E(U|F, e_h) = 25 > E(U|S, e_l) = E(U|S, e_h) = 10$. For the high performer with $U(\$m) = (40m)^{0.5}$, $E(U|F, e_l) = 32 > E(U|S, e_h) = 31 > E(U|S, e_l) = 28 > E(U|F, e_h) = 22$. For the lower performer with $U(\$m) = (40m)^{0.5}$, $E(U|F, e_l) = 32 > E(U|F, e_h) = 22 > E(U|S, e_l) = 3 > E(U|S, e_h) = -1$.

(1983) tested the standard-based 'bang–bang' contract analysed by Demski and Feltham (1978) versus a linear (fixed pay) contract. He found that subjects who self-selected the 'bang-bang' contract had a higher mean performance capability than those who self-selected the fixed pay contract. However, since Chow's study did not include state risk, it could not address the effects of state risk and controllability filters.

Waller and Chow (1985) extended Chow's study in several ways, including the use of standard-based dichotomous contracts. They found that subjects with higher performance capabilities self-selected contracts which paid higher per unit bonuses for performance in excess of standard. Waller and Chow also tested the effects of performance measures that controlled or did not control for the effects of state risk. They predicted that in the absence of a controllability filter, risk preference and performance capability would jointly affect contract self-selection, and that when a controllability filter is present, the role of risk preference would be reduced. Their results were consistent with this prediction: Performance capability and performance incentives (i.e., size of the per unit bonus) in the selected contract were more highly correlated when a controllability filter was present than when it was absent.

While Waller and Chow (1985) have shed some light on the effects of state risk on contract selection, their finding is subject to three limitations. First, risk aversion was assumed such that its effect on contract selection was not explicitly tested. Second, Waller and Chow did not distinguish between the choice of effort that is made *ex ante* and that made *ex post* to state revelation. When a controllability filter is absent, revelation of the state after contract selection may alter a worker's expected marginal return to effort, in turn affecting his/her effort choice (Baiman and Evans, 1983; Penno, 1984). Hence, the realized state, jointly with the presence/absence of a controllability filter, may affect performance subsequent to contract selection. Waller and Chow did not empirically examine this potential joint effect. Finally, Waller and Chow's experimental design included state risk as a between-subjects manipulation (present or absent). Yet the subjects exposed to state risk were given the state risk manipulation as a within-subjects variable. The result is that state risk tended to 'average out' during the experiment, such that the subjects were, at best, exposed to a weak form of state risk.[6] As discussed in the next section, the current study overcomes the weakness of Waller and Chow's state risk manipulation.

Relying on the analytical and empirical research reviewed above, we hypothesize that when a controllability filter is absent, both risk preferences and performance capability would affect contract selection; but when a controllability filter is present, the effects of risk preferences would be reduced or eliminated:

H1: In the presence of state risk, individuals' choice of a performance-contingent compensation contract is a joint function of the presence/absence of a controllability filter, and their risk preference and performance capability.

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[6] In Waller and Chow's (1985) decoding task, subjects who had no state risk had to decode ten alphabets per card. Those with state risk also faced a mean of ten alphabets per card, but the actual number of alphabets per card took on seven discrete values symmetrically centred on the mean. Since each subject completed over ten cards, on average, during the experiment, the realized state tended also to equal ten alphabets for these subjects. Thus, state risk was only weakly manipulated, at best, in the experiment.

A more detailed discussion of the directional effects is deferred to the results section, fter the experimental method has been explained. This is because the relative effects f factors like state risk and performance-contingent compensation can be expected to epend on the magnitudes of these factors.

A major assumption made by both Demski and Feltham (1978) and Waller and how (1985) is that an individual chooses an effort level simultaneously with the ompensation contract. However, as Waller and Chow acknowledge, this effort choice ay be altered due to subsequent changes in the employment setting. One such change s state realization. When a controllability filter is present, the realized state will not ffect how performance is measured, hence leaving unaffected the worker's expected arginal return to effort. In contrast, when a controllability filter is absent, the ealization of a favourable (unfavourable) state would increase (decrease) a worker's xpected marginal return to, and thus choice of, effort (Baiman and Evans, 1983; enno, 1984). Hence, we predict that the realized state, jointly with the presence/ bsence of a controllability filter, would affect the *ex post* effort choice:

H2: The relationship between an individual's actual work effort and his/her expected work effort at contract selection is a joint function of the realized state and the presence/absence of a controllability filter.

EXPERIMENTAL METHOD

verview

laboratory experiment was conducted using 121 students enrolled in a senior level nance course at a large metropolitan university.[7] The experimental task was adopted om Chow, Cooper and Waller (1988). It required each subject to translate triplets of umbers (e.g., 451) into alphabetic letters. Each subject went through a pre-test ession, received feedback on his/her performance capability, and then selected one of wo performance-contingent compensation contracts before state revelation (i.e., how any alphabets would be required to count as one unit of measured performance). fter completing the task, each subject received a cash payment based on his/her ctual measured performance and compensation contract.

Each subject was randomly assigned to one of two experimental groups—con- rollability filter present or absent. Subsequent to this assignment, each subject was ermitted to self-select between a piece-rate and a standard-based compensation ontract. This self-selection process expanded the experiment to a 2 × 2 between- ubjects design with contract choice as the added two-level, between-subjects variable.

dministration of the Experiment

he experiment was administered in two sessions: a pre-test session and an experi- ental session. Subject assignment to experimental treatment was done between the wo sessions.

As discussed further below, five of these subjects had to be dropped due to failing the experimental validity checks, leaving a final sample of 116 for hypothesis testing.

Pre-test session. This session was used to obtain measures of each subject's performance capability and risk preference. First, the decoding task was explained by the experimenter to the subjects. Then each subject performed the task for five minutes and was given feedback on the number of alphabets that had been correctly decoded. When the subjects indicated that they understood the task, they were instructed to translate as many triplets of numbers as possible in a fifteen-minute 'training' period.[8] At the end of the training period, the subjects answered a question designed to estimate their risk preference, and the session was concluded.[9]

The interim. In the interim, the subjects were assigned to the two controllability filter conditions to attain pre-experimental equivalence on the cells' performance capability and risk preference measures. Performance capability was measured by the number of alphabets a subject had correctly decoded in the training session.[10] The two (marginal) means were 161.89 and 159.69 (Table 1), which were not significantly different ($t = 0.29$; $p = 0.77$). The (marginal) means for risk preference were also not

TABLE 1

DESCRIPTIVE STATISTICS BY MARGINALS

		Controllability filter		Contract	
		Absent	Present	PR^a	S^b
	N	61	55	74	42
Performance capability	$\bar{X}$	161.89	159.69	176.82	132.69
	s	39.79	40.58	33.75	34.48
Risk preference	$\bar{X}$	2.31	2.54	2.36	2.67
	s	1.32	1.62	1.56	1.28
Performance	$\bar{X}$	186.00	177.02	196.37	155.98
	s	41.30	37.15	34.95	33.61

[a] PR = Piece rate contract.

[b] S = Standard-based contract.

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[8] While the subjects were not paid for their performance in this fifteen-minute period, participation in this pre-test session was necessary for receiving cash payment in the experimental session.

[9] The risk preference question was: 'Suppose I were to ask you to perform the decoding task again for fifteen minutes. This time assume that you will be paid cash if you decode at least as many letters as you did in the first session. *You will be paid nothing if you do not decode as many letters as you did before.* If you decode at least as many letters as before, you may elect to receive $2.50 for certain, or one of a set of gambles that may result in you getting paid more than $2.50 for your efforts or $0 for your efforts with the probabilities described below.

a. Would you perform the task again under the above circumstances? ______Yes ______ No

b. If you would participate, which of the following ways would you choose to be paid?' The five response alternatives were $2.50 for certain, and $3.75 ($5.00, $6.25, $7.50) with 67% (50%, 40%, 33%) probability and $0 with 33% (50%, 60%, 67%) probability.

[10] This measure of performance capability is adopted from Chow (1983) and Waller and Chow (1985). As Waller and Chow (1985, fn. 3) have observed, a potential limitation of this measure is that it '... captures a skill–effort combination rather than skill *per se*'. In most real-world tasks (including tests of intelligence), performance is necessarily jointly determined by an individual's skill and effort, and to identify the unique contributions of skill and effort is difficult if not impossible. Note that in our test for effort effects (H2), each subject's actual performance is standardized through division by his or her performance capability. To the extent our measure of performance capability already includes effort effects, our results relate to the *marginal* effects on effort of our experimental variables.

significantly different ($\bar{X} = 2.31, 2.54$, Table 1; $t = 0.85$, $p = 0.40$: see Measurement section for how risk preference was measured).

Experimental session. The experimental session occurred about one week after the pre-test session. It began with a review of the general instructions, after which each subject was given feedback on his/her performance capability. The mean and standard deviation of all subjects' performance capability were also disclosed. Next, the subjects were given written instructions on the procedure for the experimental session. They were told that a different set of triplets and translation key would be used and that they would be paid cash for their performance.[11] The state risk and controllability filter treatments were operationalized by varying the subjects' written instructions as follows.

State risk. Each subject was told that there was an equal chance of receiving either of two sets of sheets. One set would require seven translated alphabets to complete each sheet, while the other would require thirteen translated alphabets per sheet. (In contrast, Waller and Chow, 1985, varied the state level across answer sheets *within* a subject.)

Controllability filter. The subjects with a controllability filter were told that regardless of which set of sheets they received, their pay would be determined by the number of alphabets correctly decoded. Subjects without a controllability filter were told that their performance measure for pay purposes would be the number of sheets completed. Since there were either seven or thirteen required alphabets per sheet, measured performance for the latter group was significantly affected by the realized state (i.e., set of sheets), while the former group's measured performance was only minimally affected by state realization, if at all.

After reading the written instructions but before receiving the set of sheets, each subject was required to indicate on a contract selection form a preference between two compensation contracts. Contract *PR* was a piece-rate contract that paid \$0.15 for each sheet completed for those subjects without a controllability filter and \$0.015 for each alphabet translated for those subjects with a controllability filter.[12] Contract *S* was a standard-based contract in which pay equalled a fixed salary of \$2.35 plus a unit bonus for measured performance in excess of a standard. For the subjects with a controllability filter, the standard was 160 alphabets and the bonus was \$0.005 for each alphabet decoded in excess of the standard.[13] For those without a controllability filter, the standard was sixteen answer sheets and the unit bonus was \$0.05 per answer sheet.[14] Figure 1 illustrates the forms of the two compensation contracts in the

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[11] Changing the triplets helps to control for confounding due to learning. Both Chow (1983) and Waller and Chow (1985) retained the same codes across trials. As Waller and Chow acknowledge (p. 471), such learning could have confounded their results.

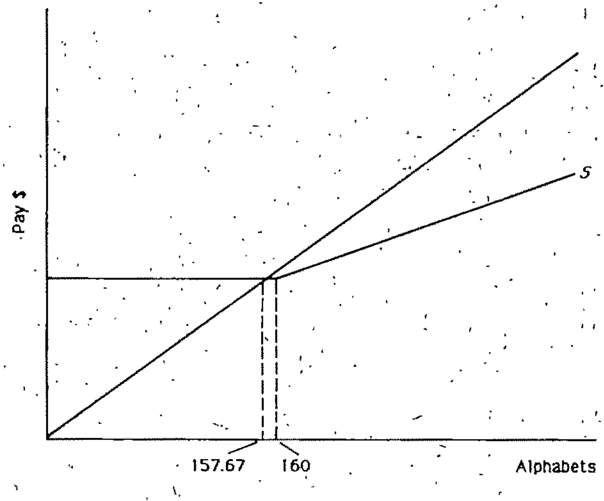
[12] The pay per alphabet (\$0.015) was equal to the pay per sheet (\$0.15) divided by the expected number of alphabets (10) per sheet.

[13] The standard of 160 alphabets was the mean performance of the 121 subjects who completed the pre-test session, five of whom were subsequently dropped due to failing the validity check questions.

[14] The subjects without a controllability filter were told that proportional payment would be made for the last answer sheet being worked on at the end of the experimental session. This condition was aimed at making the pay contract for the subjects without a controllability filter continuous (as it was for the subjects with a controllability filter), rather than a step function with each answer sheet as a step.

FIGURE 1

COMPENSATION CONTRACTS WITH THE CONTROLLABILITY FILTER PRESENT*
(NOT TO SCALE)



*PR: Pay = \$0.015 x Alphabets;
S: Pay = \$2.35 + \$0.005 x (Alphabets – 160).

presence of a controllability filter. Note that contract *PR* can be viewed as a simplified standard-based contract in which both the fixed salary and standard are equal to zero.

In order to isolate the self-selection effects of pay contract *form*, it was necessary to control for the effects of each contract's parameter values. To accomplish this, the parameters of the two contracts were set to produce equal mean pay across cells and across all subjects. For each cell, the performance capability of each of the 121 subjects who had completed the pre-test session was used to compute his/her pay under the alternate pay contracts, using the expected value (ten alphabets required per sheet) of the state variable. The contracts' parameters were adjusted until ones were found that produced equal mean pay for both contracts in each cell. An additional constraint placed on the selected parameter values was that pay (calculated based on the subjects' performance capability) had to be higher for about half of the subjects under the *PR* contract, and higher for the remaining subjects under the *S* contract. This constraint was necessary because a major objective of the experiment was to test for the effects of performance capability on contract selection. Such a test would not have been possible if the expected pay under one contract had dominated that under the other regardless of a subject's performance capability.

As will be discussed later, five of the 121 subjects were subsequently dropped due to failing validity checks. For the 116 subjects retained in the final sample, mean pay under both contracts ranged from \$2.41 to \$2.43 across the four cells.[15] A 2 × 2 epeated measures analysis of variance (ANOVA) with contract and controllability lter as independent variables found no significant difference in expected pay > 0.90). The break-even point between the two contracts was 157.67 alphabets, or bout the median of the 121 subjects' performance capability distribution (Figure 1).[16] he close proximity of the break-even point to the median performance capability is nother indication that, by design, pay (based on performance capability) was higher nder each contract for about half of the subjects.

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[15] The slight difference in expected pay across cells is due to five of the 121 subjects subsequently being dropped due to failing the validity check questions. As the ANOVA results indicate, this did not significantly affect the mean pay equivalence across cells.

After the subjects had selected their contracts, they were asked to write down the umber of alphabets that they expected to translate in the upcoming fifteen-minute eriod and to complete a set of validity check questions. These questions were esigned to test each subject's understanding of the contract that he/she had selected. hen each subject performed the decoding task for fifteen minutes. At the end of this roduction' period, each subject answered two manipulation check questions con- erning the controllability filter treatment, and two more validity check questions bout pay calculation for hypothetical numbers of alphabets decoded. Five subjects ailed to answer correctly either the pre- or post-experiment validity check questions bout pay calculations and were eliminated from the hypothesis tests, leaving a final ample of 116 subjects.

easurement

o facilitate interpretation of the results, the variables were measured as follows. ontract *PR* was coded as a zero and contract *S* was coded as a one. Controllability lter was coded as a zero when it was present and a one when it was absent. Risk reference was reversed measured on a five-point scale so that the scale values creased with increasing risk aversion. Performance capability was measured as the umber of alphabets correctly translated during the pre-test session. Performance was easured by the actual number of alphabets correctly translated in the experimental ssion. Finally, since performance is a function of work effort, the ratio of an dividual's actual to expected performance was used as a proxy for the relation etween his/her *ex post* and *ex ante* effort choices.

RESULTS

anipulation Checks

wo questions were used to assess the success of the state risk and controllability filter anipulations. Both used a ten-point scale, anchored by 1 ('To a very small extent') nd 10 ('To a very large extent'). The first question was 'To what extent was your hoice of the pay schedule affected by the fact that you might get a packet containing

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Setting the break-even point between the two contracts at about the median performance capability helps to assure that for a number of subjects without a controllability filter, measured performance and expected pay under the two contracts would be significantly affected by both performance capability and the realized state. Recall that a favourable (unfavourable) state realization increases (decreases) measured performance by 30% from the mean of the state distribution. If the selected parameter values always yields a higher or lower expected total pay under one contract even with a 30% change in measured performance, then the potential for the state variable to affect contract choice would be reduced or eliminated.

answer sheets with either seven or thirteen spaces?' The mean responses across subject were significantly different (F = 30.09, $p < 0.001$) for those subjects without controllability filter ($\bar{X} = 5.41$) compared to those subjects with a filter ($\bar{X} = 2.72$). Th other question was 'To what extent did the uncertain number of spaces on the answe sheets cause the amount of your pay to be outside of your control?' The mea responses across subjects were again significantly different (F = 32.88, $p < 0.001$ for the presence ($\bar{X} = 3.50$) and absence ($\bar{X} = 6.12$) of the controllability filter. Thes results indicate that the operationalization of the experimental manipulations wa successful.

Descriptive Statistics

Table 1 presents the marginal means and standard deviations for the measure variables. Table 2 presents these data for each cell of the 2 × 2 design, and Table 3 contains an intercorrelation matrix. The only significant correlation in Table 3 is between performance capability and performance, which is consistent with prio research (Chow, 1983; Waller and Chow, 1985; Chow *et al.*, 1988).

TABLE 2
DESCRIPTIVE STATISTICS BY CELL

Controllability filter		Absent		Present	
Contract		*PR*[a]	*S*[b]	*PR*	*S*
	N	37	24	37	18
Performance capability	$\bar{X}$	174.11	143.04	179.54	118.89
	s	38.25	35.07	28.83	26.16
Risk preference	$\bar{X}$	2.08	2.67	2.63	2.67
	s	1.28	1.34	1.56	1.24
Performance	$\bar{X}$	199.00	165.96	193.73	142.67
	s	38.37	41.36	31.47	20.73

[a] *PR* = Piece rate contract.
[b] *S* = Standard-based contract.

TABLE 3
PEARSON CORRELATIONS (N = 116)

	Performance capability	Risk preference	Performance
Performance capability	1.00		
Risk preference	−0.09	1.00	
Performance	0.85*	−0.07	1.00

* $p < 0.001$

Hypothesis 1

H1 predicted that in the presence of state risk, contract selection would be a function of the presence/absence of a controllability filter, risk preference and performance apability. Since the dependent variable and one of the independent variables (con-rollability filter) were dichotomous, conditional logit analysis was used to test this ypothesis.[17] The results are reported in Table 4.[18] To facilitate interpretation of the ıteraction effects, the risk preference measure was standardized (Z) based on the istribution for the 116 subjects so that subjects who were relatively risk averse seeking) would have a positive (negative) value for this variable. In similar manner, erformance capability was also standardized (Z) such that relatively high (low) values ould have a positive (negative) sign.

TABLE 4
LOGIT RESULTS FOR H1

ıdependent variable	Coefficient	Asymptotic t	Significance level
isk preference (RP)	0.7516	1.96	< 0.10
ontrollability filter (CF)	2.6551	2.00	< 0.05
erformance capability (PC)	−1.1432	2.57	< 0.05
F × RP	2.6331	2.05	< 0.05
F × PC	3.7046	1.99	< 0.05
P × PC	−1.0301	−2.12	< 0.05
F × RP × PC	1.7411	0.94	> 0.10
onstant	−0.2984	−0.90	> 0.10

symptotic $R^2 = 0.43$
^{2} (7 df) = 61.56 ($p < 0.001$)

The dependent variable is the compensation contract, with the PR contract coded as a zero and the S contract coded as a one.

Table 4 indicates that the overall model was significant, as assessed by a likelihood ıtio test ($\chi^2 = 61$ (7 df), $p < 0.001$), with an asymptotic R^2 of 0.43. Both con-ollability filter (CF) and performance capability (PC) had significant main effects < 0.05), while the main effect due to risk preference (RP) was not significant > 0.05).

Table 4 also shows that the CF × PC × RP interaction was not significant ($p > 0.10$). Ience, H1 was not supported. Note, however, that all three two-way interactions CF × RP; RP × PC; and CF × PC) were significant ($p < 0.05$). Since understanding ıe nature of these interactions can yield insights into the contract selection decision, e provide below a further analysis of each two-way interaction. This discussion will ot examine the main (linear) effects because linear effects should not be interpreted in ıe presence of significant interactions (Neter and Wasserman, 1974).

First consider the CF × RP interaction, which suggests that the presence of a

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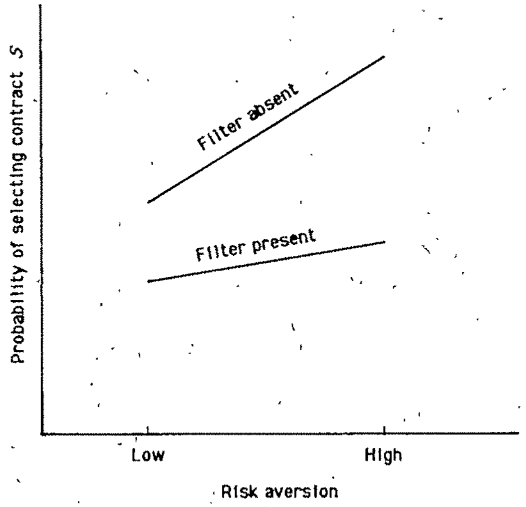
Both ordinary least squares and analysis of variance were rejected because of their distributional assumptions. Discussions of these assumptions are in Theil (1971) and Eisenbeis (1977). Conditional logit analysis is explained in McFadden (1973) and Amemiya (1981). Prior applications of logit analysis in accounting research include Hagerman and Zmijewski (1979), Ohlson (1980), Chow and Rice (1982), and Lee and Hsieh (1985).

This analysis was also performed by standardizing performance capability around the break-even point (157.67 alphabets) between the two contracts instead of the sample mean of 160. The findings were unchanged.

controllability filter affects the role of risk preference in contract selection. To see th direction of this interaction, recall that CF was coded as a zero when the filter wa present. Hence, the CF × RP variable could take on a non-zero value only when th filter was absent. Further, recall that contract *S* was coded as a one and contract *P* was coded as a zero. Hence, the positive coefficient of 2.63 for the CF × RP interactio indicates that when the controllability filter was absent, the probability of a subjec choosing contract *S* increased with his/her risk aversion. The nature of this interactio is illustrated in Figure 2.

FIGURE 2

AN ILLUSTRATION OF THE NATURE OF THE CF × RP INTERACTION



A potential reason behind the direction of the CF × RP interaction is contract *S*'s lower down side risk. When the controllability filter was absent, there was a 0.50 probability of realizing the adverse state (each decoding sheet requiring thirteen alphabets), which would push measured performance significantly downwards. And when measured performance was below the break-even point between contracts *PR* and *S*, pay was higher under contract *S* (Fig. 1).

The significant negative coefficient (−1.03) for the RP × PC interaction indicates that individuals with greater aversion to risk and/or lower performance capabilities were more likely to select contract *S*. The nature of this interaction is illustrated in Figure 3. To see the kind of contract selection that this directional interaction reflects, consider an individual who is risk averse, such that his/her standardized value of RP would tend to be positive. If he/she also has a low PC (such that the standardized value of this variable would tend to be negative), the value of the RP × PC variable would tend to be negative. The tendency of such an individual to select contract *S* (which pays more than contract *PR* for relatively low performance levels) would yield a negative coefficient for the RP × PC variable. On the other hand, a risk verse individual with a high PC would tend to have a positive value for RP × PC. The reference of such an individual for the *PR* contract (perhaps because it pays more for erformance levels exceeding the break-even point between the *PR* and *S* contracts) ould also yield a negative RP × PC coefficient.

FIGURE 3
AN ILLUSTRATION OF THE NATURE OF THE RP × PC INTERACTION

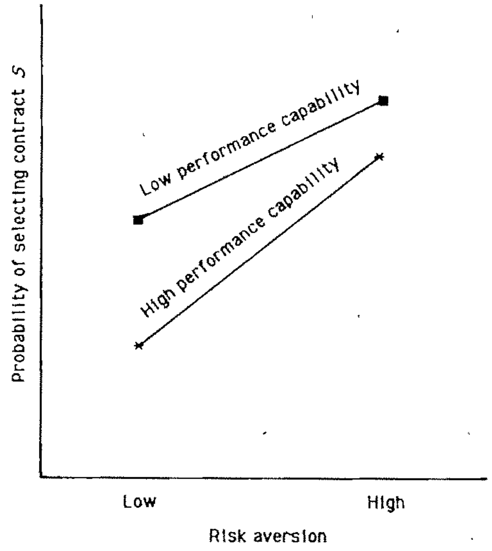
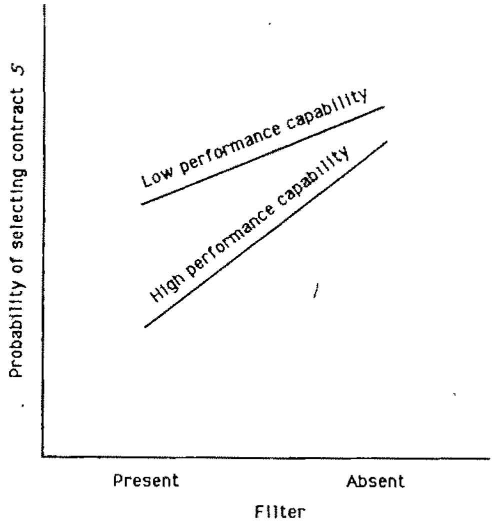


FIGURE 4
AN ILLUSTRATION OF THE NATURE OF THE CF × PC INTERACTION



The third significant two-way interaction, CF × PC, had a positive coefficient o 3.70. The direction of this interaction is illustrated in Figure 4. It indicates that in th absence of the controllability filter (CF = 1), subjects with higher performanc capabilities (hence more positive standardized PC measures) were more likely to selec contract *S* (coded as a one). This result is contrary to our expectation, since w surmised that subjects with higher performance capabilities would prefer the *P* contract's higher pay for relatively high performance levels. The limited data collecte in the experiment precluded further empirical investigation of the potential causes fo this counter-intuitive result, though some conjectures are possible. One possible caus of the observed result is the relative impact of state risk and PC within the experiment Using the expected value of the state variable (ten alphabets required per sheet) as th base, the realization of either a favourable (i.e., seven alphabets required per sheet) o unfavourable (i.e., thirteen alphabets required per sheet) state would affect measure performance by 30 per cent. For most of the subjects, the magnitude of this impac surpassed the effects due to differences in PC and probably those due to effort as well To the extent high PC subjects selected contract *S* to safeguard the results of thei work effort, the CF × PC effect would have been positive.[19] Future studies are neede to explore the validity of this and other potential explanations.

Hypothesis 2

H2 predicted that the relationship between actual and expected work effort would depend jointly on the realized state and the presence/absence of a controllability filter. This hypothesis was addressed with a 2 × 2 ANOVA and *t* tests. The independent variables were the realized state and the presence/absence of a controllability filter. The dependent variable was the ratio of actual performance to expected performance. Both numerator and denominator were measured in number of alphabets because output measures (i.e., number of sheets decoded) were subject to confounding by the realized state and the presence/absence of a controllability filter.[20] The subjects with the *S* contract were excluded from this analysis because contract *S* was only piecewise linear, such that a subject's marginal return to effort (hence effort choice) would vary with the segment of the pay function where he/she happens to be placed due to the realized state. In contrast, the *PR* contract paid a constant marginal return to measured performance and permitted control over this confounding factor.

In the ANOVA, neither main effect nor the interaction effect was significant ($p < 0.10$). Tests of the cell means (Table 5) versus the value one indicated that these ANOVA results are due to the realized state and controllability filter affecting only one of the four cells. When the adverse state (thirteen alphabets required per sheet) was realized, both subjects with and without a controllability filter performed at about the same level as they had expected at the time of contract selection ($\bar{X} = 1.03$ and 1.04, respectively, both t values < 1.45, $p > 0.10$). Since the subjects without a controllability filter had had a 30 per cent reduction in marginal return to effort (due to each sheet requiring three more alphabets than the expected value of ten), this result suggests that they still exerted the level of effort that they had chosen at the time of contract selection.[21] Different results were obtained for subjects with a favourable realized state (seven alphabets required per sheet). Among these subjects, those with a controllability filter performed at about the level that they had selected ($\bar{X} = 1.04$, $t = 0.87, p > 0.10$), but those without a controllability filter significantly outperformed their their prior expectation ($\bar{X} = 1.14$, $t = 3.46, p < 0.01$). Since the marginal return to effort for the latter subjects had been increased by about 30 per cent due to the favourable realized state, this result suggests that they had responded by increasing their effort levels.

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[19] One way to explore the validity of this explanation is to contrast the contract selections of the no-filter subjects who had performance capabilities that were more than 30% above or below the break-even point between the two contracts. Such a test was not feasible because only a few subjects had performance capabilities more than 30% away from the break-even point.

[20] Since the cells were not equally shielded from state effects (i.e., filter present vs. filter absent), an output measure such as sheets completed would have been confounded by state realization. To overcome this problem, the number of alphabets correctly translated was used as the performance measure for the test of H2 since it is affected by neither the state realization nor the presence/absence of a controllability filter.

TABLE 5
DESCRIPTIVE STATISTICS FOR H2

State[a]		7		13	
Controllability filter		Absent	Present	Absent	Present
	N[d]	16	17	20	13
AP/EP[b]	$\bar{X}$	1.14	1.04	1.04	1.03
	s	0.17	0.17	0.13	0.16
	N	16	21	21	16
AP/PC[c]	$\bar{X}$	1.21	1.09	1.12	1.09
	s	0.16	0.15	0.13	0.16

[a] State = the number of alphabets required per sheet.
[b] AP/EP = Actual performance divided by expected performance; both in alphabets.
[c] AP/PC = Actual performance divided by performance capability; both in alphabets.
[d] N differs for AP/EP and AP/PC because some subjects did not answer the question about expected performance.

To further analyse the subjects' effort choice subsequent to state revelation, we normalized each subject's actual performance in alphabets by his/her performance capability, and repeated the preceding analysis. The descriptive statistics are presented in Table 5. A 2 × 2 ANOVA indicated a significant effect for the controllability filter ($F(1, 70) = 5.16$, $p < 0.03$). When the filter was present, there was no significant difference due to the realized state ($t = 0.01, p > 0.99$). But when the filter was absent, the mean ratio of 1.21 for the favourable realized state was marginally significantly greater than that for the adverse state ($\bar{X} = 1.21$ and 1.12, $t = 1.88, p = 0.07$). Also, with an adverse realized state, the presence or absence of the filter did not have a significant effect on performance ($\bar{X} = 1.09$ and 1.12, respectively, $t = 0.67, p = 0.51$), but with a favourable realized state, the mean for the no-filter group ($\bar{X} = 1.21$) was significantl greater than that for the filter group ($\bar{X} = 1.09$, $t = 2.46$, $p = 0.02$).

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[21] There is evidence that people exert effort necessary to reach selected goal. See Locke *et al.* (1981) for a survey and discussion of research on this topic.

SUMMARY AND DISCUSSION

This study has provided experimental evidence that in the presence of state risk, a employee's choice of compensation contract depends jointly on two contract attribute controlled by the employer—how pay relates to measured performance and th presence/absence of a controllability filter—and two personal attributes of th employee—risk preference and performance capability. These findings provide furthe support for prior analytical and empirical studies indicating that an employer's desig of compensation contract attributes may lead to employees with particular persona attributes being attracted to a certain type of organization.

The experimental evidence also indicated that the presence/absence of a controllability filter can affect employees' work effort subsequent to contract selection. Regardless of the realized state, individuals whose contracts included a controllability filter performed at about the same level as they had expected at the time that they selected their contracts. Among the subjects without a controllability filter, those with an adverse realized state still performed at about the same level as their prior expectations, even though their marginal pay per unit of effort had been substantially reduced. This result is consistent with the notion that after a person selects a goal (e.g., his/her own performance expectation), he/she will exert the effort necessary to achieve that goal (Locke, Saari, Shaw and Latham, 1981). In contrast, the no-filter subjects who had a favourable realized state significantly outperformed their expected levels.[22] Thus, those subjects who were exposed to state risk and who realized the favourable state adjusted their effort after contract choice and state revelation. Taken together, these results are consistent with Waller and Chow's (1985) suggestion that the design of compensation contracts should attend not only to how the contract features may affect employee self-selection, but also how they may affect employees' reactions to subsequent developments in the employment setting.

As with all experimental research, the findings of this study are a function of the specific manipulations, including the type of task and subjects, and the specific compensation contract forms and parameter values. Future research is needed to assess the robustness of the results to changes in these aspects of the experiment. Among the potential directions for such future research are the following. First, like previous experimental research in this area, the present study has attempted to limit measurement errors in the dependent variable by using an assembly-line task. To address issues of management (as opposed to operational) control, replications using managerial tasks are desirable. Second, this study has used students as subjects. While the type of task and setting in this experiment may make students reasonable surrogates for active job-market participants, it is potentially fruitful to use subjects who are active in, or experienced with, job markets. This is especially so if managerial asks are to be used. Finally, since typical employment relationships span multiple eriods, extending the study to a multiperiod setting would be desirable.

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[22] Recall that the performance measure used in these tests was the number of alphabets, and differences in this measure are not due to state realizations.

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ABACUS, Vol. 25, No. 1, 1989

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Cash Flow Accounting Revisited: A Note on a Partial Replication of the Lee Study

This paper examines the attitudes of audit partners in U.S. public accounting firms towards various forms and dimensions of cash flow accounting (CFA), and in part replicates Lee's 1981 study. A total of 800 questionnaires were mailed. Despite the call by some cash flow proponents (i.e., Thomas, 1974) for additional CFA disclosures, the conclusions drawn from this study were that the current historical costs system is, in general, regarded as adequate for evaluating the economic performance of an entity, and there is a perception that publicly disclosed, supplementary cash flow information is not required.

Key words: Accounting policies; Cash flow; Performance evaluation.

In 1981 Lee reported a survey of chartered accountants of Scotland engaged in industry and commerce regarding their views about various dimensions of cash flow accounting (CFA). Four per cent of the respondents indicated that CFA should be introduced as a *complete substitute* for the present system of allocation-based accounting data, while 45% indicated that it should be introduced as an addition to the present system. Forty-one per cent of the respondents disagreed, however, indicating that it should neither serve as a complete substitute nor an addition to the current reporting format. Past CFA data, in contrast, was determined to be useful to bankers, lenders, institutional and private shareholders, employees and suppliers (ranging from 88% for bankers to 58% for suppliers). In the area of CFA forecasts, 42% of the respondents indicated that such schedules should be introduced as a part of the external financial reporting system.

In contrast to the populations studied by Lee, the current study surveyed audit partners in U.S. accounting firms. This group was selected due to their considerable experience in financial reporting. It is possible that, even though the official stance of the accounting profession in the U.S.A. has until recently tended to de-emphasize the role of CFA, pragmatic concerns associated with this group's audit experiences might produce a more receptive attitude regarding cash flow information than found by Lee. Furthermore, the subsequent issuance of the Financial Accounting Standards Board's Standard No. 95, *Statement of Cash Flows* (1987), might also tend to engender a more liberal posture towards CFA.

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RESEARCH METHODOLOGY

A total of 800 questionnaires were mailed. Of this number, 67 were undeliverable and returned. Thus, a base of 733 was employed in computing the response rate. Of this figure, 201 were usable, resulting in a response rate of 27.4%. The results are depicted in Tables 1 and 2.

The respondents were asked to react to the nine statements in Table 1 by indicating the extent of their agreement, with the categories ranging from 'Very strongly disagree' to 'Very strongly agree', the midpoint being 'Uncertain'. For purposes of computing mean scores, the categories were valued at one through seven, with 'Very strongly disagree' representing the low, and 'Very strongly agree' the high value. Two of the nine statements in Table 1 (8 and 9) were, in general, replicated from Lee's article. The remaining seven were designed to encompass perceptions regarding other facets of CFA, from its view as a profitability measure to the number of years a cash flow statement should be included in the annual report.

DISCUSSION OF RESULTS

A review of Table 1 indicates a series of reactions to the statements that tend to range from neutral to negative. About one half (52.2%) of the subjects regarded cash flow from operations as a profitability measure, while 32.5% agreed that cash flow from operations on a per share basis should be required. The next two statements (3 and 4) pertained to the utility of CFA and historical cost net income in evaluating economic performance. Only 8.1% of the respondents perceived cash flow from operations as more meaningful than net income in financial analysis, while 68% stated that historical net income is adequate for that purpose.

Statement 5 concerns a format issue, proposing that a cash flow from operations statement be shown adjacent to the income statement (as recommended by Ketz and Largay, 1987). Only 16% agreed with this proposal, while 33.5% responded favourably to the notion of a cash based income statement (statement 6), as advocated by Thomas (1969, 1974). Statement 7 is the only cash flow item with which a majority (75%) concurred. However, this view conforms with current and past generally accepted accounting principles (GAAP). That is, a statement of changes in financial position was required to be disclosed for the same number of years as the income statement covered. The same applies to its successor, the *Statement of Cash Flows*. Not surprisingly, this item also achieved the highest mean score (4.96) of the nine.

The accounting literature has been replete with a discussion of the merits of CFA forecasts. However, only 16% of the respondents to this survey favoured the proposal (statement 8). Thus, the respondents overwhelmingly rejected the notion that a CFA forecast be included as part of the external financial statements. This compares with 42% who favoured such a report in Lee's study. Lastly, not one respondent agreed with the proposal (statement 9) that CFA accounting should completely replace historical cost accrual accounting. This result correlated strongly with the Lee study, in which only 4% favoured the concept.

TABLE I
PERCEPTIONS REGARDING CASH FLOW AND HISTORICAL COST DATA

		Very strongly agree	Strongly agree	Agree	Uncertain	Dis-agree	Strongly disagree	Very strongly disagree	Total	Mean score
1 Cash flow from operations is a valid measure of profitability	*n*	17	33	54	6	49	22	18	199	4.13
	%	8.5	16.6	27.1	3	24.6	11.1	9.0		
		Total % agree 52.2				Total % disagree 44.7				
2 Cash flow from operations should be required on a per share basis in annual reports	*n*	6	23	36	28	55	26	26	200	3.57
	%	3.0	11.5	18.0	14.0	27.5	13.0	13.0		
		Total % agree 32.5				Total % disagree 53.5				
3 Cash flow from operations is a more meaningful number than net income from operations in evaluating the economic performance of a firm	*n*	2	3	11	16	82	37	47	198	2.64
	%	1.0	1.5	5.6	8.1	41.4	18.7	23.7		
		Total % agree 8.1				Total % disagree 83.8				
4 At the present time, historical cost net income is an adequate income measurement indicator of a firm's economic performance	*n*	4	29	101	13	41	6	3	197	4.58
	%	2.0	14.7	51.3	6.6	20.8	3.0	1.5		
		Total % agree 68.0				Total % disagree 25.3				
5 A cash flow from operations statement should be shown directly next to the income statement in the annual report. (Side by side with the income statement)	*n*	5	6	21	36	76	30	25	199	3.19
	%	2.5	3.0	10.6	18.1	38.2	15.1	12.6		
		Total % agree 16.1				Total % disagree 65.9				
6 A cash flow (cash basis) income statement should be included in the annual report	*n*	15	16	36	9	61	25	38	200	3.42
	%	7.5	8.0	18.0	4.5	30.5	12.5	19.0		
		Total % agree 33.5				Total % disagree 62.0				
7 A statement of cash flows should be included in the annual report on a comparative basis for the same number of years as the income statement	*n*	28	46	76	11	25	10	4	200	4.96
	%	14.0	23.0	38.0	5.5	12.5	5.0	2.0		
		Total % agree 75.0				Total % disagree 19.5				

TABLE 1 (continued)

		Very strongly agree	Strongly agree	Agree	Uncertain	Disagree	Strongly disagree	Very strongly disagree	Total	Mean score
8 A cash flow forecast should be included as part of the external financial statements	*n*	3	6	23	22	78	30	37	199	2.98
	%	1.5	3.0	11.6	11.1	39.2	15.1	18.6		
			Total % agree 16.1				Total % disagree 72.9			
9 Cash flow accounting should completely replace historical cost accrual accounting as the basis for financial reporting	*n*	0	0	0	4	21	51	123	199	1.54
	%	0	0	0	2.0	10.6	25.6	61.8		
			Total % agree 0				Total % disagree 98.0			

TABLE 2

CASH FLOW FORMAT AND UTILITY TO USERS

The statement of cash flows should be presented via the following format:

Operating, investing, and financing	*n* 139	% 71.3	Indirect method	*n* 104	% 56.5
Sources and uses	*n* 56	% 28.7	Direct method	*n* 80	% 43.5
	Total 195	100.0		Total 185	100.0

Potential utility to users of:

		Past cash flow data				Cash flow forecasts		
		Useful	Not useful	No opinion		Useful	Not useful	No opinion
Bankers	*n*	187	3	5	*n*	171	7	7
	%	95.9	1.5	2.6	%	92.4	3.8	3.8
Lenders	*n*	189	3	3	*n*	173	6	6
	%	96.9	1.5	1.5	%	93.5	3.2	3.2
Institutional shareholders	*n*	147	28	19	*n*	128	31	25
	%	75.8	14.4	9.8	%	69.6	16.8	13.6
Private shareholders	*n*	134	40	19	*n*	114	46	24
	%	69.4	20.7	9.8	%	62.0	25.0	13.0
Employees	*n*	63	85	46	*n*	57	94	33
	%	32.5	43.8	23.7	%	31.0	51.0	18
Suppliers	*n*	139	40	16	*n*	104	60	20
	%	71.3	20.5	8.2	%	56.5	32.6	10.9
Government	*n*	54	99	40	*n*	39	108	37
	%	28.0	51.3	20.7	%	21.2	58.7	20.1
Customers	*n*	56	105	33	*n*	42	109	33
	%	28.9	54.1	17.0	%	22.8	59.2	18

Table 2 lists the responses regarding the appropriate format for the cash flow statement, as well as the perceived utility of CFA data to various user groups. As the figures indicate, 71% favoured the operating, investing and financing format, while 56.5% opted for the indirect method of computing cash flow from operations. Standard No. 95 requires the operating, investing and financing classification, and recommends the direct method.

In the area of past CFA data, the respondents regarded it as useful to bankers, lenders, institutional and private shareholders, and suppliers (ranging from 69% for private shareholders to 96.9% for lenders). These figures, in general, correspond to those of Lee. Furthermore, a minority found such information to be useful to either government (28%), customers (28.9%), or employees (32.5%). These percentages are also similar to Lee's findings.

The final survey area concerned the perceived utility of CFA forecasts to those same user groups. In contrast to the negative responses to statement 8, concerning mandatory external CFA forecasts, the respondents indicated that this data would be useful to bankers, lenders, institutional and private shareholders, and suppliers (ranging from 56.5% for suppliers to 93.5% for lenders). As in the case of the past CFA data, the information was not deemed to be useful to government, customers or employees. Presumably, such forecasts would be distributed privately to these parties. These responses are not compared to the Lee study due to the fact that he did not include this question in his survey.

CONCLUSIONS

This study surveyed U.S. audit partners' perceptions of various dimensions of cash flow information. In general, cash flow from operations was neither regarded as a profitability measure nor viewed as more meaningful than net income in evaluating the economic performance of an entity. Furthermore, there was little sentiment to either require cash flow from operations on a per share basis, place such a statement adjacent to the income statement, replace the income statement with one consisting of cash flows, or require cash flow forecasts as a part of the external reporting system.

A significant finding, however, is that past cash flow information and cash flow forecasts were regarded as useful to bankers, lenders, institutional and private shareholders, and suppliers. This same information, though, was not perceived as having much utility to customers, the government or employees. The research results should be of interest to such policy-making bodies as the FASB and the SEC, as well as reporting companies, in preparing information for their various constituencies.

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Typeset by Solo Typesetting, South Australia
Printed in Australia by Impact Printing Pty Ltd

ABACUS, Vol. 25, No. 2, 1989

CHAUNCEY M. DEPREE, JR

Testing and Evaluating a Conceptual Framework of Accounting

As a step toward developing a widely accepted theory to guide the standards-making process and the accounting profession, the Financial Accounting Standards Board submitted a conceptual framework to the profession for its consideration. Its purpose is to provide guidance in the choice among alternative accounting methods for an issue. Whether the conceptual framework performs its function can be objectively evaluated only when it is applied to issues and tested through a rigorous procedure. A rigorous procedure to evaluate a theory has two conceptually distinguishable but interrelated parts: (a) testing the set of sentences constituting the logical structure of the theory and its inferences by way of mathematical or logical proofs, and (b) evaluating the content of the sentences constituting the theory and its inferences by way of evidence, be it empirical, intuitive, or otherwise.

The purpose of this study is to test the logical structure of the conceptual framework. The results of the study provide a demonstration that the structure of the conceptual framework is logically consistent and that inferences from the structure of the conceptual framework to alternative methods for an issue are deductively valid. The study also exemplifies an application of the structure of the conceptual framework in the selection of an alternative method for an issue. The application explicitly interrelates the structure and content of the conceptual framework.

Key words: Accounting principles; FASB statements.

A widely accepted theory to guide the standards-making process and the accounting profession has consistently appeared as a desirable or essential attribute of the profession's common body of knowledge. As a step toward that goal, the Financial Accounting Standards Board (FASB or the Board) submitted to the accounting profession a conceptual framework which it claimed 'can provide a constant thread of reason, a basis for solution—a constitution—to guide the FASB. It will narrow the range of alternatives to be considered by the Board because some alternatives will clearly be "unconstitutional"' (FASB, 1976, p. 6).

A necessary condition of theory acceptance is a public demonstration that the theory serves the function for which it was designed. Whether the conceptual framework performs its function can be objectively evaluated only when it is applied to issues, rather than speaking in terms of what may or may not be 'constitutional'.

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Without a rigorous evaluation procedure, each individual has a subjective notion about the guidance provided by the conceptual framework. Since subjective notions are private, and therefore beyond testing, the rigorous procedure must be explicit, open to inspection, and verifiable.

A rigorous procedure to evaluate a theory has two conceptually distinguishable but interrelated parts: (a) publicly testing the set of sentences constituting the logical structure of the theory and its inferences by way of mathematical or logical proofs—also referred to as testing whether the conceptual framework is adequate for providing guidance; and (b) evaluating the content of the sentences constituting the theory and its inferences by way of evidence, be it empirical, intuitive, or otherwise—also referred to as evaluating whether the conceptual framework provides adequate guidance. Both the testing and the evaluating parts of this procedure are objective in that others can independently confirm the logical tests or the evidence in affirmation or denial of the sentences of the theory and its inferences.

The purpose of this study is to test the logical structure of the conceptual framework. Mathematical logic is used. Mathematical logic is appropriate for the purpose of this study because (a) 'all disciplines—whether in the humanities, social sciences or sciences—rest on inferences, and mathematical logic has no rivals in the study of inferences' (DeLong, 1970, p. 229); and (b) it promotes an explicit translation of the conceptual framework from English to logic notation. Once translated, the structure of the conceptual framework and its consequences can be objectively tested for consistency and deductive validity.

The results of this study provide a public demonstration that the structure of the conceptual framework is logically consistent and inferences from the structure of the conceptual framework to alternative methods for an issue are deductively valid. The conceptual framework is, therefore, demonstrably adequate for providing guidance. The study also exemplifies an application of the structure of the conceptual framework in the selection of an alternative method for an issue. The application explicity interrelates the structure and content of the conceptual framework.

CONSISTENCY AND DEDUCTIVE VALIDITY

Crucial attributes of any rigorous theory are logical consistency and deductive validity. Inconsistent theory is worthless and provides no guidance (Bergmann, Moor and Nelson, 1980, chs 3 and 8). Validity is a valuable attribute because it is truth preserving; that is, if the premises of a valid argument are true the conclusion must be true. Validity provides a demonstrable link from an accounting theory to practice through the choice between alternative accounting methods for an issue. Validity of arguments is demonstrated in the Valid Argument Forms (VAF; see Appendix A for the Legend of logical symbols used in the study and Appendix B for the VAFs.)

Since an argument with inconsistent premises by definition is valid, premises are also tested for consistency.[1] Only if the premises are consistent can an argument be sound. As soundness is a primary concern in appraising arguments (Shepard, 1973, p. 81), consistency must be demonstrated for each VAF. (Demonstrations of consistency of premises will be provided upon request.)

THE TRANSLATION PROCESS

The translation process is the key to objective tests of the structure of the conceptual framework. Translation from vernacular English to logical symbols requires interpretation of the meaning of sentences, and judgments about translations:

> Symbolization is necessary not only to escape the ambiguities of ordinary language but also to reveal clearly the form of the argument. When an argument has been symbolized and its form revealed, the proof of validity (or invalidity) can then proceed on the basis of rules or formulae governing the manipulation of *symbols*—the proof of validity, in other words, is entirely independent of 'intuition' or 'beliefs' as to what seems to follow from what. (Carlson and Lamb, 1981, p. 557)

Since this study applies formal logic as a means of assessing the structure of the conceptual framework, the translation process should also be open to inspection, critical review and verification. Translation should proceed by a careful specification of the conceptual framework and alternative methods of accounting for issues.[2] Therefore, the translation process is made explicit and open to evaluation through a three-phase translation process. Each sentence will be (a) expressed in English, for example, quoted from the conceptual framework; (b) translated to an intermediate stage of stilted 'logikese'; and (c) translated to symbolic notation.

FORMAL STRUCTURE OF THE CONCEPTUAL FRAMEWORK

The conceptual framework's recognition criteria, also referred to as financial statement reporting requirements, are the basis for narrowing the range of alternative accounting methods for an accounting issue. The recognition criteria identify the transactions or events that are to be recognized in the financial statements (SFAC 5, 1984, para. 6). The conceptual framework specifies transactions or events to be recognized in financial statements as follows: '[a]n item and information about it should meet four fundamental recognition criteria to be recognized and should be recognized when the

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[1] Two sentences are logically inconsistent if it is impossible that both be true. The sentences, 'assets have probable future economic benefit' and 'assets do not have probable future economic benefit', are inconsistent. One of them must be false. (See also footnote 6, which discusses a more complex example of a contradiction and its consequences.)

[2] The wording of the conceptual framework has been faithfully followed even when it was tempting to alter the structure of the reporting requirements to make minor corrections. For example, consider the redundancy in SFAC 5 (1984), paragraphs 63 and 65. The recognition and measurement concepts are translated and symbolized as worded and not adjusted to eliminate the redundancy. Redundancy does not pose a problem as inconsistency does. The theory is merely less elegant than it could be.

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criteria are met . . . Those criteria are: (a) *Definitions* . . . (b) *Measurability* . . . (c) *Relevance* . . . (d) *Reliability*', (SFAC 5, 1984, para. 63). The domain or universe of discourse is transactions or events accounted for through an alternative accounting method, say Γ_i, for an issue. In 'logikese': Given any x, where x is a type of transaction or event accounted for through an alternative method, Γ_i, for an issue, x satisfies the financial statement reporting requirements of the conceptual framework (R_x) if and only if x meets the definitional requirements (D^f_x), x meets the relevance requirements (R^v_x), x meets the reliability requirements (R^y_x) and x meets the measurability requirements (M_x). In symbolic form, the logically determined financial statement reporting requirement is: $(X)(R_x \leftrightarrow (D^f_x \,\&\, R^v_x \,\&\, R^y_x \,\&\, M_x))$. Each recognition criterion has a formal structure which is fully specified below. The conceptual framework guides the specification of each recognition criterion's formal structure. The structure of the recognition criteria will be delineated in the following order: (a) definitions, (b) relevance, (c) reliability, and (d) measurability.

1. Definitions of Elements

The process of specifying the definitional criterion should make classification rational and expeditious (Kegley and Kegley, 1984, ch. 3). As proffered in the conceptual framework, transactions or events are classified according to elements of financial statements (elements or element categories): asset (A), liability (L), revenue (R^n) (gain (G)),[3] expense (E^x) (loss (L^o), investment by owners (I^n), distribution to owners (D), and changes within equity that do not affect assets or liabilities (CWE)[4] (SFAC 6, 1985).

Any transaction or event is supposed to be captured by one of the element categories. Furthermore, the element categories are mutually exclusive (SFAC 6, 1985, paras. 54, 64, 88, 231, 245); that is, no case should occur in which a transaction or event is a member of more than one element category. In logic notation, the definitional requirement is symbolized as follows: given any x, where x is a transaction or event accounted for through alternative Γ_i for an issue, x meets the definitional requirements if and only if x meets the requirements of an asset or the requirements of a liability . . . or the requirements of a change within equity that does not affect assets or liabilities, and it is false that x meets the requirements of any two or more element categories. $(X)(D^f_x \leftrightarrow ((A_x \mathrm{\ v\ } L_x \mathrm{\ v\ } R^n_x \mathrm{\ v\ } E^x_x \mathrm{\ v\ } I^n_x \mathrm{\ v\ } D_x \mathrm{\ v\ } CWE_x) \,\&\, -((A_x \,\&\, L_x) \mathrm{\ v\ } (A_x \,\&\, R^n_x) \mathrm{\ v\ } (A_x \,\&\, E^x_x) \mathrm{\ v\ } \ldots \mathrm{\ v\ } (D_x \,\&\, CWE_x) \mathrm{\ v\ } (A_x \,\&\, L_x \,\&\, R^n_x) \mathrm{\ v\ } \ldots \mathrm{\ v\ } (A_x \,\&\, L_x \,\&\, R^n_x \,\&\, E^x_x) \mathrm{\ v\ } \ldots \mathrm{\ v\ } \ldots \mathrm{\ v\ } (A_x \,\&\, L_x \,\&\, R^n_x \,\&\, E^x_x \,\&\, I^n_x \,\&\, D_x \,\&\, CWE_x))))$.

Furthermore, the element categories are presented in SFAC 6 as having necessary and sufficient characteristics. For example, '[a] liability has three essential characteristics: (a) it embodies a . . . probable [5] future transfer or use of assets . . . (b) the duty or responsibility obligates a particular entity, leaving it little or no discretion to avoid the future sacrifice, and (c) the transaction or other event . . . has already happened' (SFAC 6, 1985, para. 36). The translation into logic notation is as follows: given any x, where x is a transaction or event accounted for through method Γ_i for an issue, x is a liability (L_x) if and only if x embodies a . . . probable future transfer or use of assets . . . (O_x), is a duty or responsibility obligating a particular entity leaving it little or no discretion to avoid the future sacrifice (S_x), and . . . has already happened (P_x). $(X)\,(L_x <\!\!-\!\!> (O_x \,\&\, S_x \,\&\, P_x))$.

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[3] Revenue (expense) is an element category, but gain (loss) is not. Gain (loss) is a type of revenue (expense). The distinction between revenue (expense) and gain (loss) is a matter of display rather than recognition (SFAC 6, 1985, para. 89).

[4] Equity comprises comprehensive income, investment by owners, distribution to owners, and changes within equity that do not affect assets or liabilities. Comprehensive income and investments by, and distributions to, owners account for all changes in equity of a business enterprise during a period. Comprehensive income consists of revenues, expenses, gains, and losses (SFAC 6, 1985, paras. 20, 21, 64, 65).

Therefore, if the transaction or event fails to satisfy at least one of the essential characteristics of the element category, then it is not a liability. If the transaction or event satisfies all the essential characteristics of a liability, it is considered a liability. The other element categories are also in the form of necessary and sufficient characteristics.[6]

2. *Relevance*

'To be relevant, information about an item must have feedback value or predictive value (or both) for users and must be timely' (SFAC 5, para. 73). Given any x, where x is a transaction or event accounted for through alternative Γ_i for an issue, x is relevant (R^v_x) if and only if x has feedback value (F_x) or predictive value (P^d_x), and x is timely (T_x). $(X)(R^v_x <\!\!-\!\!> ((F_x \vee P^d_x) \,\&\, T_x))$.

3. *Reliability*

'To be reliable, information about an item must be representationally faithful, verifiable, and neutral' (SFAC 5, 1984, para. 75). Given any x, where x is a transaction or event accounted for through alternative Γ_i for an issue, x is reliable (R^y_x) if and only if x is representationally faithful (RF_x), verifiable (V_x), and neutral (N_x). $(X)(R^y_x <\!\!-\!\!> (RF_x \,\&\, V_x \,\&\, N_x))$.

4. *Measurability*

With regard to measurability, '[t]he asset, liability or change in equity must have a relevant attribute that can be quantified in monetary units with sufficient reliability'

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[5] Probable is defined in SFAC 6 (1985), footnote 25, as 'that which can reasonably be expected or believed on the basis of available evidence or logic but is neither certain nor proved'.

[6] If a type of transaction or event is captured by more than one element category, the element categories would be shown not to be mutually exclusive. Such an event would not result from a strictly logical analysis of the structure of the conceptual framework. It would arise from an application of the conceptual framework. For example, assume it is discovered that a type of transaction or event c accounted for through method w satisfies all the essential criteria of both the asset and expense element categories. The conjunction, A_c and E^x_c, contradicts the definitional requirement of the conceptual framework. (A proof will be provided upon request to the author.) From a contradiction any conclusion whatsoever can be validly deduced. The content of the conceptual framework, therefore, would be worthless—it would provide no guidance at all. An actual application or test of the content of the conceptual framework is beyond the scope of this paper. Note, however, that assuming the structure of the conceptual framework, and the findings A_c and E^x_c are based on critical evidence (see footnote 19), it would be inter-subjectively verifiable that the conceptual framework would provide inadequate guidance. The testing and evaluation process would also direct attention specifically to where revision of the conceptual framework would be needed.

(SFAC 5, 1984, para. 65). Given any x, where x is a transaction or event accounted for through alternative Γ_i for an issue, x meets the measurability requirements if and only if x meets the definitional requirements, the relevance requirements, the reliability requirements and is quantified in monetary units. $(X)(M_x <\!-\!> (D^f_x \ \& \ R^v_x \ \& \ R^y_x \ \& \ Q_x))$. (See footnote 2.)

Cost/Benefit and Materiality

Recognition criteria are also subject to cost/benefit and materiality constraints. Materiality is not, however, a fundamental recognition criterion, because 'no general standards of materiality can be formulated' (SFAC 2, 1980, para. 131). However, if a general standard of materiality is formulated, it could be included with the recognition criteria. Similarly, since costs and benefits are difficult, if not impossible, to measure (SFAC 1, 1978, para. 23), the cost/benefit constraint is treated as a conditional financial statement reporting requirement. If costs and benefits are quantified in monetary units, they would be considered an additional recognition criterion.

CONCLUSIONS ABOUT THE LOGICAL STRUCTURE OF THE CONCEPTUAL FRAMEWORK

If the logical structure of the conceptual framework is consistent, and if the structure of the conceptual framework can accommodate deductively valid inferences either affirming or denying an alternative accounting method for an issue, then the conceptual framework is adequate for providing guidance.

The sentences constituting the structure of the conceptual framework are proven logically consistent.[7] Furthermore, the structure of the conceptual framework can accommodate deductively valid inferences either affirming or denying an alternative accounting method for an issue. First, consider the affirmation of an alternative method. Assume a is a type of transaction or event that can be accounted for by alternative method y. Furthermore, assume D^f_a, R^v_a, R^y_a and M_a are affirmed. Given $(X)(R_x <\!-\!> (D^f_x \ \& \ R^y_x \ \& \ R^y_x \ \& \ M_x))$, it follows validly that R_a, that is, any type a transaction or event accounted for through alternative method y meets the financial statement reporting requirements and should be reported in accordance with alternative method y in the financial statements. Therefore, the logical structure can accommodate implying an alternative accounting method (see VAF 1; Appendix B). Next, assume b is a type of transaction or event that can be accounted for by alternative method z. Furthermore, assume D^f_b, R^v_b, R^y_b or M_b is denied, that is, $-D^f_b$, $-R^v_b$, $-R^y_b$ or $-M_b$. Given $(X)(R_x <\!-\!> (D^f_x \ \& \ R^v_x \ \& \ R^y_x \ \& \ M_x))$, it follows validly that $-R_b$, that is, any type b transaction or event accounted for through alternative method z does not meet the financial statement reporting requirements and is not reported in accordance with alternative method z in the financial statements. Therefore, the logical structure can accommodate not implying an alternative accounting method (see VAF 2, Appendix B). Furthermore, it validly follows that the structure of the conceptual framework is adequate for providing guidance.[8]

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[7] A formal proof will be provided upon request to the author. The proof includes all the symbolized sentences specified above and the symbolized sentences of the definitions not specified or translated above. It is a lengthy proof because the definitional criterion requires mutually exclusive element categories.

AN EXAMPLE OF AN APPLICATION OF THE CONCEPTUAL FRAMEWORK

Logic can be both flexible and inflexible. Logic is flexible in the sense that a wide variety of sentences, which capture a multitude of evidence and beliefs, can be symbolized in logic. Logic is inflexible in the sense that once the user accepts a set of sentences and their translation into symbolic notation the conclusions, if validly deduced, follow necessarily by the rules of logic. Furthermore, acceptance or rejection of a translation of a sentence, or acceptance or rejection of the truth of a sentence, may alter the outcome of the deductions, and ultimately the guidance of the conceptual framework.

Logic can bring rigour and order to the testing and evaluating process of a theory and operationalize logical consistency and deductive validity. Nevertheless, evidence—empirical or otherwise—proffered in affirmation or denial of the sentences of the theory and its inferences remains an essential ingredient in the evaluation of a theory. As demonstrated in the previous section, the structure of the conceptual framework is adequate to provide guidance. Yet to be determined is whether the conceptual framework provides adequate guidance.[9] The determination of whether the conceptual framework provides adequate guidance is not a matter solved by logical or mathematical proofs. The determination of whether the conceptual framework provides adequate guidance is effected through evidence in confirmation or disconfirmation of the sentences that make up the conceptual framework in use.[10] In order to be able to evaluate whether the conceptual framework provides guidance, guidance must be explicitly specified.

Specification of Guidance

The specification of guidance is also implied by the conceptual framework. The explicit specification of guidance provides a means of evaluating how well the conceptual framework accomplishes its goal. Since the Board's effort to develop a conceptual framework was undertaken to provide guidance in choosing among alternative accounting methods for an issue, whether the conceptual framework serves its purpose is tested as follows:

> Let Γ_1, Γ_2, Γ_3, . . ., Γ_n be the alternative accounting methods for an issue. The conceptual framework provides adequate guidance for the issue if and only if the conceptual framework identifies Γ_1 and does not identify Γ_2 or Γ_3 or . . . Γ_n, or the

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[8] If the evidence does not warrant the affirmation or denial of a financial statement reporting requirement, neither conclusion is validly deducible. The structure, nevertheless, is adequate to provide guidance even though the evidence or content of the conceptual framework is deficient.

[9] The determination of whether the conceptual framework provides adequate guidance is, of course, beyond the scope of this study.

[10] Theory confirmation is briefly discussed below in the Recommendations section.

conceptual framework identifies Γ_2 and does not identify Γ_1 or Γ_3 or . . . or Γ_n, or . . ., or the conceptual framework identifies Γ_n and does not identify Γ_1 or Γ_2 or Γ_3, or . . . Γ_{n-1}.

If the conceptual framework provides adequate guidance, it serves its purpose. If Γ_1, $\Gamma_2, \ldots, \Gamma_n$ are the accounting alternatives for an issue, and the conceptual framework identifies only Γ_1 and Γ_2, the conceptual framework reduces the number of alternatives. The conceptual framework then provides some, but not adequate, guidance. If the conceptual framework identifies all alternatives, it provides no guidance for the issue being tested.[11]

The conceptual framework's recognition criteria—that is, financial statement reporting requirements—define the boundaries of transactions or events that should be recognized in financial statements (SFAC 5, 1984, para. 6). The recognition criteria are related to identification as follows:

> The conceptual framework identifies an accounting method Γ_i for an issue if and only if transactions or events accounted for through Γ_i for the issue:
>
> 1. satisfy the financial statement reporting requirements of the conceptual framework, and they are, according to their advocates, supposed to satisfy the financial statement reporting requirements; *or*
> 2. do not satisfy one or more of the financial statement reporting requirements of the conceptual framework, and they are not, according to their advocates, supposed to satisfy one or more of the financial statement reporting requirements.
>
> The conceptual framework does not identify an accounting method Γ_i for an issue if and only if transactions or events accounted for through Γ_i for the issue:
>
> 1. do not satisfy one or more of the financial statement reporting requirements of the conceptual framework, and they are, according to their advocates, supposed to satisfy the financial statement reporting requirements; *or*
> 2. satisfy the financial statement reporting requirements of the conceptual framework, and they are not, according to their advocates, supposed to satisfy one or more of the financial statement reporting requirements. (This result does not mean that the transactions or events should not be reported in the financial statements. The result means that the advocates of the accounting method Γ_i were mistaken in their belief that transactions or events accounted for through Γ_i do not satisfy the financial statement reporting requirements.)

Transactions or events accounted for through method Γ_i for an issue satisfy the financial statement reporting requirements if and only if the transactions or events accounted for through Γ_i for the issue satisfy the definitional, relevance, reliability, *and* measurability requirements of the conceptual framework. Transactions or events accounted for through method Γ_i for an issue do not satisfy the financial statement reporting requirements if and only if the transactions or events accounted for through

---

[11] The Board recognized that the conceptual framework, like any theory, would at least need revision. 'Like other pronouncements of the Board, a Statement of Financial Accounting Concepts may be amended, superseded, or withdrawn by appropriate action under the Board's Rules of Procedure' (SFAC 6, 1985, p. ii).

Γ_i for the issue do not satisfy the definition, relevance, reliability, *or* the measurability requirements of the conceptual framework.

The following abbreviated simulation of an application of the structure of the conceptual framework is intended as an example of the interrelation of the structure and content of a theory to its evaluation. A full application of the formal structure to transactions or events accounted for through their alternative methods for an issue is accomplished by systematically applying the formal structure of the conceptual framework to each method of accounting for the issue. The process leads to identification or non-identification of the methods, and ultimately to an evaluation of the conceptual framework.[12] The formal structure and the process of identification provide researchers with a blueprint by which to evaluate whether the conceptual framework provides guidance. The conclusion as to whether the conceptual framework provides adequate guidance is made after applying the conceptual framework to issues.[13]

A limited application of the formal structure to the in-substance debt defeasance issue follows.

In-substance Debt Defeasance

Debt defeasance, which is the release of a debtor from an obligation, takes many forms including calling in bonds, purchasing and retiring bonds, trading equity shares for bonds, and 'selling' bonds by paying someone to assume the debt obligation. This study, however, considers only the issue of in-substance debt defeasance.[14]

The transactions or events that satisfy the definition of in-substance debt defeasance are considered members of the in-substance debt defeasance (ISD) set, which set contains members whose characteristics are an obligation (a) with expected cash outflows that are matched in interest and principal with the expected cash inflows of 'risk-free' securities placed in an irrevocable trust and used solely to pay the debt, and (b) with a remote possibility that the debtor will be required to make future payments with respect to that debt.

Two methods of accounting for the in-substance debt defeasance issue are considered—SFAS 76 (1983) method and the non-SFAS 76 method. Advocates of the SFAS 76 method claim that the in-substance defeased debt or the 'risk-free' securities placed in trust to service and pay the debt should not be recognized in the financial statements, but claim that the difference between the debt and the securities should be recognized as a gain. Advocates of the non-SFAS 76 method claim that in-substance defeased debt is a liability and the 'risk-free' securities placed in an irrevocable trust are assets, but do not claim that any gain arises from the difference between the debt and the securities.[15]

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[12] The provision of adequate guidance for *one* issue does not confirm the conceptual framework.

[13] The ultimate acceptance or rejection of the conceptual framework by the accounting profession, either in some final form or as a continuing project, is beyond the scope of this study.

[14] Even though the Board has issued a standard addressing in-substance defeased debt (*Statement of Financial Accounting Standards No. 76*, 'Extinguishment of Debt', 1983), the conceptual framework 'describes concepts and relations that will underlie future financial accounting standards and practices and in due course serve as a basis for evaluating existing standards and practices' (SFAC 6, 1985, pp. i–ii).

[15] Though the two predominant methods are considered, they are not meant to exhaust the possible methods of accounting for in-substance defeased debt.

Consider the following example of evidence proffered in support of affirming an essential condition, predictive value, of the recognition criterion, relevance. Predictive value means input into a predictive process, rather than a prediction[16] (SFAC 2, 1980, para. 53). Without the information of the members of ISD sets provided in the liabilities sections of the financial statements, predictions may be adversely affected. As indicated in a study on lease accounting by Abdel-Khalik, predictions may be affected because 'a substantial number of bankers and analysts think, incorrectly, that a company with off-the-book leases is more profitable than a company with the same liability on the balance sheet' (Hershman, 1982, p. 56). The members of the set, if removed from the balance sheet, could also be considered an off-balance sheet financing arrangement with the same potential to affect adversely the predictive process of some users. Therefore, the members of the ISD set accounted for through the non-SFAS 76 method, a, have predictive value P^d, $-P^d_a$.[17]

Since $(X)(R^v_x <\!-\!> ((P^d_x \vee F_x) \,\&\, T_x))$, P^d_a, and assuming T_a is affirmed, then R^v_a.[18] Therefore, transactions or events that are members of the ISD set accounted for through the non-SFAS 76 method are relevant. (VAF will be provided upon request.)

Furthermore, since $(X)(R_x <\!-\!> (D^f_x \,\&\, R^v_x \,\&\, R^y_x \,\&\, M_x))$, R^v_a, and assuming D^f_a, R^y_a and M_a, then R_a (see VAF 1, Appendix B). Therefore, transactions or events that are members of the ISD set accounted for through the non-SFAS 76 method for the in-substance debt defeasance issue would satisfy the financial statement reporting requirements. Transactions or events that are members of the ISD set accounted for through the non-SFAS 76 method would, in this hypothetical example, satisfy the definitional, relevance, reliability, and measurability requirements of the conceptual framework. Furthermore, since the transactions or events accounted for through the non-SFAS 76 method do, according to their advocates, satisfy the financial statement reporting requirements, the conceptual framework would identify the non-SFAS 76 method for the in-substance debt defeasance issue.

RECOMMENDATIONS

As this study focused on logical tests of the conceptual framework, the recommendations focus on what may be done with the conceptual framework as it is tested and evaluated through the logical structure and specification of guidance. The actual application of the conceptual framework may be enhanced by critical evidence brought to bear on any of the financial statement reporting requirements.[19] The notion of critical evidence is used to demonstrate how the conceptual framework, through the formal structure, eliminates accounting methods and exemplifies how the conceptual framework *may* provide adequate guidance. The FASB or knowledgeable researchers could select a particular financial statement reporting requirement which appears to provide the most likely opportunity for eliminating one or more alternative accounting methods. One or more studies focusing on the particular financial statement reporting requirement could then be conducted. If the studies result in findings that provide critical evidence to deny at least one necessary characteristic or condition of one financial statement reporting requirement, then critical evidence would provide a reason to eliminate one or more accounting methods for an issue.

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[16] A more complete understanding of each necessary condition of the recognition requirements is obtained by reviewing the text of the conceptual framework.

[17] It is not claimed that the evidence is sufficient to warrant affirmation of this sentence.

[18] Affirming predictive value and timeliness or feedback value and timeliness is sufficient validly to deduce relevance. Feedback value was not logically needed as part of the demonstration.

[19] Evidence bearing on an issue is apt to be critical if the evidence is the result of many studies which apply different methods of investigation, and if the evidence is in general agreement.

For example, assume it appears that verifiability is the most likely opportunity to deny one accounting method (Γ_1) over another (Γ_2) because researchers suspect that measurers are *not* likely to obtain the same measure for the type of transactions or events defined by set a accounted for through Γ_1. Logical and evidential reasons would then exist to reject accounting method, Γ_1. Consider the following proof.

> Universe of discourse: transactions or events that are members of the set a accounted for through Γ_1.
>
> 1. $(X)(R_x \leftrightarrow (D^f_x \,\&\, R^v_x \,\&\, R^y_x \,\&\, M_x))$—specifies logically determined financial statement reporting requirement.
> 2. $(X)(R^y_x \leftrightarrow (RF_x \,\&\, V_x \,\&\, N_x))$—specifies reliability.
> 3. $-V_a$—the research finding(s) that members of set a do not meet the verifiability condition.
> 4. Therefore, $-R^y_a$—2, 3. The members of set a do not meet the reliability recognition requirement of the conceptual framework. (Similar to VAF 2.)
> 5. Therefore, $-R_a$—1, 4. See VAF 2. Transactions or events that are members of set a accounted for through Γ_1 do not satisfy the financial statement reporting requirements.
>
> Furthermore, since they do, according to Γ_1 advocates, satisfy the financial statement reporting requirements, the conceptual framework does not logically identify Γ_1 for the issue.

Thus, the FASB would have one less accounting method with which to contend.[20] However, if the studies affirm the selected financial statement reporting requirement, then the particular accounting method would not be rejected.

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[20] This is akin to Karl Popper's falsifiability process. His formal approach to science proceeded by noting that there is no complete confirmation of a theory but that a theory can be falsified. The falsifiability relationship between theory and evidence is, however, not clearly distinguished through a strictly logical analysis. The logical relation is clear for simple argument forms, like modus tollens. For example, assume T stands for the theory being tested; O stands for observation report. If T, then O; and not O; are the premises of the argument, then not T is a valid conclusion. The theory is falsified. Note that the link between theory and observation is more complex. Theory is usually a multitude of propositions. For example, if T_1 and T_2, then O; and -O; are the premises, a valid conclusion is not both T_1 and T_2. The conclusion is equivalent to not T_1 or not T_2. Logic does not indicate which theoretical proposition is false or whether both are false. Popper is aware of this difficulty. He advocates departing from a strictly logical analysis in order to test theories. Popper suggests that certain theoretical propositions are, by agreement, not in question. Convention among knowledgeable scientists leads empirical tests to be focused on one proposition instead of the entire set of sentences making up the theory. So too could convention among knowledgeable accounting researchers play a role of focusing research efforts to the most likely refutable reporting method. (See Goodman, 1965; Hempel, 1943; Nagel, 1979; and Popper, 1959, 1965.)

CONCLUSION

The results of the study provide a demonstration that the structure of the conceptual framework is logically consistent and inferences from the structure of the conceptual framework to alternative methods for an issue are deductively valid. Therefore, the conceptual framework is adequate for providing guidance. The study also exemplified an abbreviated application of the structure of the conceptual framework in the selection of an alternative method for an issue. The application explicitly interrelated the structure and the content of the conceptual framework.

The formal structure and specification of guidance can provide the accounting profession with a means of rigorously testing the structure of the conceptual framework. Without a formal structure and specification of guidance, each individual has a subjective notion about whether the conceptual framework is adequate for providing guidance.

While a rigorous procedure provides its users with a common methodological framework to test and evaluate the conceptual framework, other factors influence the choice among alternative accounting methods for an issue. For example, economic consequences and political influence affect the choice among alternatives (e.g., Zeff, 1972). Nevertheless, if the FASB applies and, as needed, revises the conceptual framework as part of its procedure for deciding among alternative accounting methods for issues, the conceptual framework will provide guidance in the future.

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APPENDIX A
LEGEND

Logic Symbols

(X), universal quantifier: Given any x, . . .

-, negation: a negated sentence is true if and only if the sentence is false.

->, conditional: . . . if x is a β, then x is a σ. A conditional is true if and only if the antecedent is false or the consequence is true.

&, conjunction: . . . x is a β and x is a σ. A conjunction is true if and only if both conjuncts are true.

v, disjunction: . . . x is a β or x is a σ. A disjunction is true if and only if at least one disjunct is true.

<->, biconditional: . . . x is a β if and only if x is a σ. A biconditional is true if and only if its components (β and σ) are either both true or both false.

APPENDIX B

Valid Argument Forms. All proofs are demonstrated by way of the tree test procedure (*see*, Bergmann, *et al.*, 1980).

VAF 1

$(X)(\beta_x <-> (\sigma_x \& (\Phi_x \& (\epsilon_x \& \Omega_x))))$

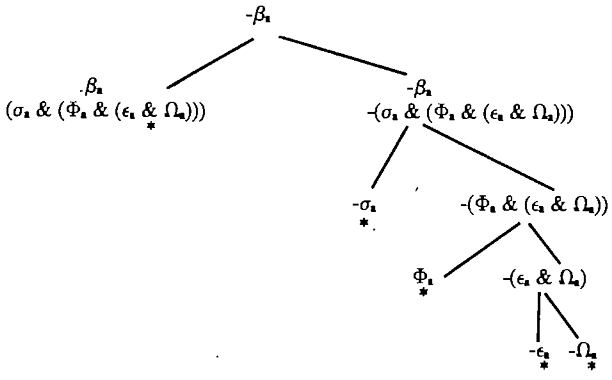
σ_x

Φ_x

ϵ_x

Ω_x

Therefore, β_x

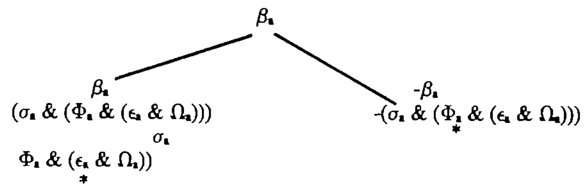


VAF 2

$(X)(\beta_x <-> (\sigma_x \& (\Phi_x \& (\epsilon_x \& \Omega_x))))$

σ_x

Therefore, $-\beta_x$



ABACUS, Vol. 25, No. 2, 1989

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Accounting and the Input–Output Principle in the Prehistoric and Ancient World

The paper offers mainly an interpretation of Professor Schmandt-Besserat's archaeological research from an accountant's point of view. Its major conclusion is that those ancient people were the first to apply the input–output principle (inherent in every actual commodity transfer) to a representational, quasi-numerical (and later numerical) system of record keeping. A second aspect of this paper reveals that both the token-accounting of the ancient Middle East, as well as modern accounting, deal with two distinct but related duality aspects. The first kind of duality involves concrete transactions and belongs to physical reality, while the second kind of duality arises out of ownership and debt relations which belong to social reality. The paper demonstrates how these two types of duality are related and in which way the second type can be reduced to the first type. The final section examines the possibility of connecting the input–output principle manifested in token accounting with the duality principle encountered in ancient Greek accounting practice.

Key words: Accounting needs; Bookkeeping; History.

The chief purpose of this paper is to offer some accounting interpretations of relatively recent archaeological evidence on prehistoric (i.e., pre-writing) record keeping.[1] All historic disciplines, whether archaeology, conventional history or cosmic evolution, rely on interpretations often imbued with speculations. Here the interpretations are, as much as possible, supported by hard evidence and speculations are kept within reasonable bounds. The paper pivots on the early history of record keeping rather than bookkeeping and interprets the first manifestation of the input–output principle (i.e., the conceptual representation of economic transactions). It also distinguishes two different kinds of dualities: a *fundamental duality* pertaining to physical reality, (e.g., the transfer of commodities) and a *derived duality* restricted to social reality (e.g., ownership and debt-relations).

[1] For a survey of this evidence see also Schmandt-Besserat (1980, pp. 358–61) as well as Jasim and Oats (1986, p. 348); for a somewhat different archaeological interpretation see Vallat (1986, pp. 334–37).

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Financial support for this project by the Social Sciences and Humanities Research Council of Canada, and the valuable correspondence with Professor Denise Schmandt-Besserat, are gratefully acknowledged. The paper was presented at the Fifth World Congress of Accounting Historians, Sydney, August 1988.

Schmandt-Besserat (1988), in a paper to the 5th World Congress of Accounting History on 'Accounting in Prehistory', has offered a survey of both the pertinent archaeological research and her own findings and conjectures about early accounting as the precursor of abstract counting as well as writing.[2] For this reason I shall limit my own recapitulation of that material to a minimum, and deal with those aspects indispensable for further interpretation from an accountant's point of view.

PLAIN AND COMPLEX TOKEN SHAPES AS ACCOUNTS

As was previously pointed out, collections of plain, concrete clay tokens of various shapes over 10,000 years old have been discovered among village finds (and later temple finds) unearthed in great numbers in the Fertile Crescent of the Middle East. Starting about 3250 BC, these tokens were sometimes enclosed in hollow clay balls, which Legrain (1921) originally called 'bulles sphériques' and which Schmandt-Besserat (1980, p. 359) prefers to address as 'clay envelopes'.[3] On occasion the surface of those receptacles or 'envelopes' bore markings indicating the content of the envelopes at a glance. They seem to be the earliest systematic accounting systems. Particularly striking is Schmandt-Besserat's presentation of such tokens from Uruk, and the matching of those tokens to the pertinent commodities (adapted from Schmandt-Besserat, 1983, p. 120):

Tokens (Accounts)	*Commodities*
3 incised ovoids	3 jars of oil
1 cylinder	1 animal (sheep or goat)
9 tetrahedrons	9 units of services
3 shapes of trussed ducks	3 trussed ducks
5 ovoids	5 (still unidentified)
4 parabolas	4 (still unidentified)
1 triangle	1 small measure of grain?
26 spheres	26 bariga (larger measures) of grain

Thus every type of token is basically a specific type of account—what we discriminate by words or names, the ancient Sumerians discriminated by token shapes. Thus the main feature of 'token accounting' is to be found in the diversity of shapes made possible by mouldable clay that could be hardened by kiln fire, thereby imparting greater permanence to the tokens. A hollow sphere with tokens was equivalent to a personal account representing that portion of the total assets (or equity) invested in a particular debtor, but at the same time it constituted an inventory revealing further details. As each token stood for a single piece of a commodity, quantities of various kinds of goods could easily be tracked. But this primitive form of aggregation was limited by the lack of abstract numbers.

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[2] See also the survey contained in Mattessich (1987, 1988).

[3] It is suspected that before 3250 BC token receptacles of more perishable material were used.

Complex tokens offer a greater diversity of shapes, various markings, and perforations for stringing them together which in turn indicates an increase in the number of goods accounted for. The clay receptacles, as well as the sealed strings of tokens, both correspond to accounts about stewards or debtors, with accompanying lists of inventories. After these preliminary considerations, we turn to the implications of this development. The logical structure of transactions and the various possibilities of their conceptual representation receive particular attention.

THE INPUT–OUTPUT PRINCIPLE: FROM ANCIENT MESOPOTAMIA TO THE TWENTIETH CENTURY

There exists evidence that the simple tokens represented grain, sheep and goats whereas the complex tokens represented labour and manufactured commodities. This suggests a similarity with the distinction between cash items and non-cash items in early Renaissance bookkeeping[4]; it is all the more striking as grain, sheep and goats were, indeed, the 'cash' and payment units of the ancient Middle-East.

Entities, Stewardship and Debtor Relations

I interpreted each type of token shape as a type of account, and the number of tokens (of a particular shape) contained in a clay envelope or on a string indicates the quantity of specific items. Consequently the sum-total of the various tokens in a particular envelope or on a string stood for that part of the creditor's wealth lent to a debtor. Such a primitive system is closer to physical reality than our modern monetary approach, and has the advantage of avoiding the 'valuation problem'. For this reason it is more appropriate to regard such a token aggregate as a 'superaccount', not unlike a balance sheet—it may be no coincidence that we still speak of the 'content' of an account as well as the 'content' of a balance sheet. Of special importance is the fact that those 'aggregates' had a *dual* meaning—something that may not have escaped the Sumerians: in its details it revealed individual assets; in its totality it revealed wealth or a part of it.

The entity behind such an *equity* was either a city or temple government or a personal or family unit. The levying and paying of taxes was possibly based on the farming out of temple assets to individuals (the punishment by beating in the case of refusal or inability to fulfil one's repayment or tax obligation is documented in ancient pictures). But since these 'superaccounts' would not have reflected the *total* equity of a temple, further aggregation of all those envelopes and string systems within a single precinct would have been necessary. The 'IOU' nature of such token aggregates and of the subsequent clay tablets is also documented (Schmandt-Besserat, 1986a, p. 34). From younger archaeological records, one may infer the possibility that the tokens or token aggregates were handed over as receipts to the debtor and voided once the debt was fully 'paid' (just as it was the case with the later clay tablets).

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[4] Etsuzo Kishi (1984), in discussing the Renaissance 'prototype of the double entry method'—mainly by V. Mennher (1550)—emphasizes that under this method: 'Cash, credit and debit are to be managed separately from goods. This is derived from the tradition of the ancient Roman empire' (p. 353).

The Logical Structure of a Transaction

These recent archaeological discoveries have put accounting into the limelight of the history of counting, writing and civilization. But, beyond this, they have major significance for understanding the origin and the very foundation of the input–output structure of modern accounting.

Since the late 1950s I have endeavoured to demonstrate that the foundation of accounting is not to be found in the techniques of double entry but in the logical form of a transaction (Mattessich, 1957, 1964, 1984, 1987, 1988, etc.).[5] This structure manifests itself empirically in such economic events as sales and purchases, investment and debt transactions, production and other transfer processes, etc. But at the same time this same structure can conceptually be represented not only in the form of journal and double entries but also in the form of matrices, algebraic equations, flow diagrams or networks, and vectors.[6]

The preceding recapitulation has shown that this logical form has already manifested itself in prehistoric data processing systems. Since the ancient people of the Middle East exploited the transfer of clay tokens from one location to another to represent various economic transactions, there can be little doubt that an input–output structure dominated those early accounting systems. Of course, one might argue that this is trivial since the transfer of services or commodities, from one person or place to another, is already endowed with such a duality. But this objection fails to grasp the essential point: the objection refers only to empirical structures and events, and misses the crucial idea of duplicating the input–output of actual commodities through the input–output of tokens by means of which conceptual representation of this duality becomes possible. Once this decisive fact of the input–output principle is recognized, it is a secondary problem, whether the ancient people of the Middle East possessed a double entry system or not.[7] Nonetheless, this point shall be examined later. But before that, some hidden connections between two apparently different duality aspects must be explored.

Two Kinds of Accounting Duality

Physical reality and the first type of duality. The first kind of accounting duality arises out of the physical aspects of the output of a commodity from one place, and its input to another. In general, it expresses the one-to-one correspondence between an empirical event (such as a sale and purchase, or the transfer of goods and services from one department or process to another), on one side, and some representational scheme—be it a token accounting system of ancient Mesopotamia or a computerized matrix accounting system in the twentieth century—on the other side.

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[5] Recent reference to this 'more abstract outlook' for the present and future computerization of accounting can be found in Leech (1986) and Mepham (1987).

[6] A set-theoretical analysis of this 'flow' or 'input–output' structure in terms of ownership and debt relations, etc., is found in Appendix A of Mattessich (1964, 1977 edn, pp. 448–65). To this Willett (1987, pp. 159, 162) offers the following remarks: 'Mattessich's formal theory of accounting . . . predates Ijiri's and was probably the first serious attempt to axiomatize the discipline [p. 159] . . . The two most famous and ambitious attempts to axiomatize conventional practice (Ijiri, 1965 and Mattessich, 1964) have *both* been *transactions based.* They provide certain insights into the principal elements . . . The most important contribution of Mattessich's theory was his attempt to define, albeit indirectly, the basic elements of the accounting structure in qualitative terms. *In particular a debt claim is defined* (1964, p. 449) as the value of some function—such that—$(e_i, e_j, T) = v_{ij}$, where e_i, e_j are accounting entities and T is a time interval, and v_{ij} is a value [p. 162]' (italics added).

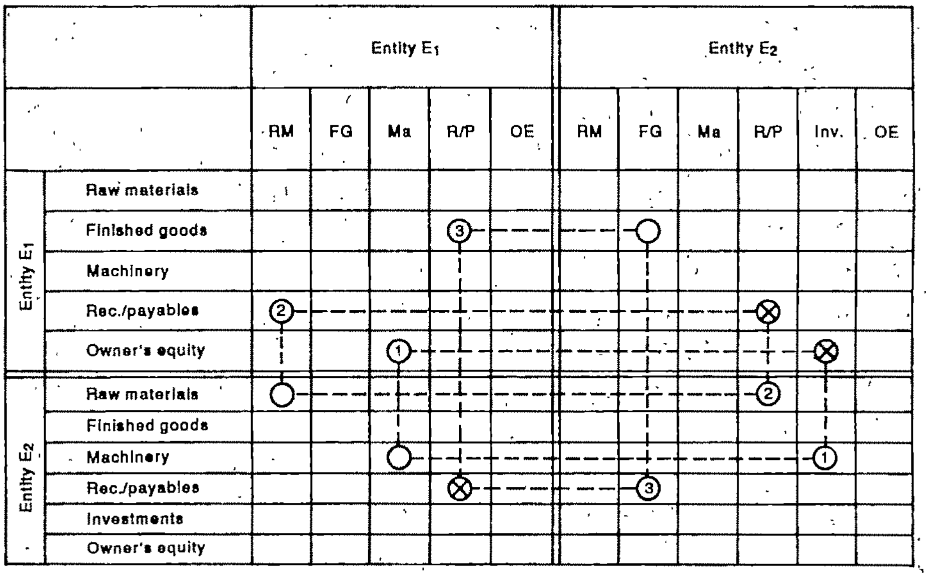
[7] The significance of the *input–output principle* for double entry accounting is well recognized in the literature. For example: 'The writer wishes to emphasize the merit that comes from understanding a double entry bookkeeping as an input–output system of data calculating the amount of capital charged' (Kishi, 1984, p. 359).

Social reality and the second type of duality. The second kind of duality seems not so much to arise out of a physical transfer, but of the fact that every asset belongs to somebody, and there is, therefore, by its very nature simultaneously an equity in it. While the first type (involving the mere transfer of goods), undoubtedly possesses a manifestation in physical reality in the broadest sense, this is not so obvious with regard to the second type which involves more complex relations such as those of ownership and investing as well as lending and borrowing—all belonging to the reality of social relations. Today, accountants regard those events also as transactions, but if we probe their roots we notice that the nature of those transactions is more abstract; yet the justification for calling them transactions may be found in their having a link to the more physical or concrete transactions. Yet what is this link?

Investing and lending activities usually result in the transfer of some commodity or the purchasing power through which a commodity can be acquired, and for the following two reasons the duality is no less present in those more abstract transactions: first, any borrowing is matched by some lending, and any investing by some ownership; second and more importantly, debt and owner's equities are *internalizing* what otherwise would be an *external physical* duality (i.e., a transaction from one entity to another). This peculiar relationship can be illustrated by Figure 1—adapted from

FIGURE 1

ACCOUNTING MATRIX OF TWO ENTITIES WITH PHYSICAL INTER-ENTITY FLOWS (AND POTENTIAL CANCELLATIONS) AS WELL AS ABSTRACT INTRA-ENTITY FLOWS



Mattessich (1964, 1977 edn, p. 455)—which reveals both the *internal* (or *intra-entity*) as well as the *external* (or *inter-entity*) flows or transactions.

Explanation to Figure 1. This combined matrix represents the following inter- and intra-entity transactions of two entities E_1 and E_2 doing business with each other. The matrix shows the credits in the rows and the debits in the columns[8]: (1) Investment of owner's equity by entity E_2 in entity E_1 by handing over some machinery; (2) Entity E_1 receives raw material from E_2 on a credit basis; (3) Entity E_1 supplies some finished goods to E_2 in cancellation of some of its debts against E_2.

The intra-entity transactions are recorded for each of those two entities and bear the pertinent sequence numbers in a circle. Since the entities are considered to be independent of each other, each event must be recorded twice—even in a two-dimensional matrix (once for E_1, the second time for E_2). But the matrix also reveals in the empty circles the, yet unrecorded, physical flows (of machinery, raw materials, and finished goods from one entity to another—i.e., the inter-entity transactions).

However, if the two entities were to merge and become merely two departments of the same firm, only those physical transactions (with empty circles), instead of the corresponding abstract ones with numerals, would be recorded (this proves that there are *physical* flows behind those inter-entity transactions which themselves reveal only *abstract* flows—e.g., between such different 'things' as Machinery and Owner's equity). Another consequence of the assumed 'merger' is that the transactions marked ⊠ (a second kind of what were originally inter-entity transactions), would be required *to cancel out* the claims or obligations between the two departments (formerly two separate entities).[9] To show how inter- and intra-entity transactions are linked with each other, we connect them (in Figure 1) with horizontal and vertical dashed lines. Hopefully this analysis has clarified those connections and shed some light on our previous assertion that the two dualities, although by no means identical, are closely tied to each other and may be considered as two aspects of a basically physical duality. Above all, it should now be obvious that the transactions involving debt or investment relations, though not themselves concrete, can be reduced (e.g., in the case of a merger) or at least traced to physical inputs and outputs.

Whether the representation of the more concrete commodity transactions preceded historically the more abstract investing and lending transactions, is not documented. But there is evidence that by 3250 BC—the time when the sealed clay envelopes and string systems emerged—accounting had already incorporated ownership claims as well as stewardship or debt relations; the latter two may not have been clearly discerned at this early stage as two different legal relations. The importance and function of the clay seals on the envelopes, as well as on the string aggregates, can be inferred from later times when a refined cuneiform writing offers detailed evidence and explanation about the legalistic or semi-legalistic function of those seals.[10] It is from those later records that the more abstract and legal relations can be inferred.

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[8] This accounting convention (in contrast to the later 'Gomberg convention' which uses the rows as debits and the columns as credits), was first adopted by the renowned logician and mathematician De Morgan (1846) and in our century by Leontief (1953) as well as Mattessich (1957, and 1964).

[9] In contrast to having separate raw material inventory and machinery accounts for each department, no separate receivables and payables accounts are assumed to be kept for each department.

But the fact that both the clay envelope as well as the string aggregate were usually firmly sealed—so that the transfer from one personal account to another was impeded—is evidence that our hypothesized transfer of tokens was allowed only to authorized persons. The seal will have been kept on as long as the personal account was 'inactive', but could be broken as soon as one or more transactions were recorded through the exchange of tokens. Afterwards a new seal, possibly incised with different appropriate data, was made. To every piece of commercial reality (a measure of grain, a ewe or ram, a jar of oil or a piece of silver) of those ancient people, there corresponded a specific token in their representational accounting system. It does not matter that this system itself consisted of concrete objects (like cylinders, cones, etc.) instead of abstract, written symbols; on the contrary this intermediary step reveals to us the evolution of a conceptual system—it not only demonstrates that abstraction is a matter of degree, but shows, first, how more abstract representational systems evolved from less abstract ones, and second, that abstraction always requires some physical intermediary (e.g., vibrating air in the case of speech or electro-chemical processes in the central nervous system). The crucial thing is that we are here not dealing with the actual transfer of commodities, but with their representation for accounting purposes.

The Hierarchy of Archaic Accounts

We have previously established that every 'asset account' seems to have been characterized by a specific token shape. But these accounts were not limited to purely tangible assets; occasionally they included a claim to services (the tetrahedron token seems to have represented a day of labour; see Schmandt-Besserat, 1980, p. 375). Beyond this lower echelon of accounts, one or two higher echelons have to be distinguished.

The second level of accounts is represented by the receptacles—that is, clay envelopes as well as string aggregates. Similar to the income statement, these would undoubtedly have been accounts of a higher echelon since they usually contained tokens of different shapes and thus summarized the content of several accounts (but unlike the income statement, they did not summarize 'nominal' but 'real' accounts).

The third level of accounts can be found in the accumulation of all clay envelopes and string aggregates within one temple precinct or other entity. If all those receptacles were kept in one room or location, then this space would, in a way, have been equivalent to our modern balance sheet (e.g., each receptacle representing an accounts receivable and the totality representing the 'owner's equity').[11]

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[10] 'Sumerian clay tablets by the tens of thousands (literally), inscribed with their business, legal, and administrative documents crowd the collections of these same museums, giving us much information about the social structure and administrative organization of the ancient Sumerians' (Kramer, 1963, p. 379).

[11] Whether the asset/equity relationship was already contemplated 5,000 years ago can be conjectured from the following facts: (a) that *debt* and *ownership relations* were already known (why else would they have used token accounting systems?)—every debt and ownership already implies a distinction between *the object* and *the claim behind it*; (b) that *total claims* were distinguished from *individual assets* (why else would they have aggregated these tokens?); and (c) that the individual tokens contained in the envelopes were impressed on the outside, indicates the need for a clearly visible summary of *the totality* (i.e., the equity-part) represented by the asset-tokens in the envelope.

But how about income measurement? Those archaic accounting systems do not offer any direct evidence for either the notion of income or any attempt of its measurement. However, it may well be possible that, whenever a debt relationship was entered and the pertinent token receptacle was created, a token was added by means of which the pertinent aggregate did not constitute the original debt but the final one, that is, augmented by an interest or income item represented by this added token. This is a procedure similar to later accounting practices, (e.g., during the sixteenth and seventeenth century), when debts were invariably recorded at their discharge value. If interest was charged at all, this scenario is more likely than the alternative of establishing the interest at the time of repayment without having any agreement and record in advance.

The Origin of Double Entry Record Keeping

We have seen above that those ancient people of the Middle East had record keeping systems, the basic logical structure of which was virtually identical to that of modern double entry. But did they have some kind of double entry record keeping? As surprising as it may seem, a good case can be made that such a double entry system (which must *not* be confused with a double-entry *bookkeeping* system) did exist over 5,000 years ago.

The original clay envelopes (*c*. 3250 BC) had a great disadvantage. One did not know their token content unless breaking the seal—which supposedly was permitted only at the event of settlement (cf. Schmandt-Besserat, 1980, pp. 366, 377; and Rosengarten, 1960, p. 221). But relatively soon after the emergence of the original envelopes (*c*. 3200 BC) it was already customary to impress the softer clay surface of those envelopes with the hardened clay tokens before putting them into the receptacle and sealing the latter.[12] This enabled one to determine at a first glance the content of the envelope while the seal and other markings may have informed about the debtor and other details. There can be little doubt that inserting a token into a receptacle was equivalent to a debit entry in an asset account. Yet there were two other requirements: first, to indicate, on the outside of the clay envelope, the individual items contained in it; and second, to disclose instantaneously the total equity represented by the receptacle. By a lucky stroke these two requirements could be met in a single step: impressing the hardened tokens upon the softer, unburned surface of the clay container. The resulting indentations are mirror pictures and true counter-entries (credit entries) on the equity side of this prehistoric record keeping system.

PREHISTORIC ACCOUNTING AND LATER DEVELOPMENTS

Except for the morphological similarities between prehistoric token accounting and the cuneiform record keeping on clay tablets, there seems to be little direct evidence for a continuous development of early accounting. To establish a link between the accounting systems of ancient Mesopotamia and those of subsequent civilizations, particularly of ancient Greece and Rome, one has to search for further evidence. In other areas, such as writing, religious myth, technology, astronomy and astrology, etc., there does exist evidence for cross-cultural influences if not continuity. On the basis of such indirect and extended limits one might conjecture that the previously discussed accounting systems of the Fertile Crescent must have had some impact on accounting systems of later periods. For example, Filios (1984/85) points out that: 'A detailed examination of the primary sources in particular, provides significant evidence about the existence of the duality principle in the bookkeeping of banks, temples and states' treasuries in ancient as well as in Byzantine Greece' (p. 171).

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[12] This inconspicuous impressing of the clay tokens upon the surface of the receptacle may turn out to have been one of the greatest steps of mankind; not only was it the precursor of modern double entry bookkeeping; more importantly, it was the major impetus to cuneiform writing as well as abstract counting.

Is it not plausible to assume that this later duality notion evolved out of the input–output principle conceived in prehistoric times? And is not the manifestation of token accounting a refutation of Filios' further claim that:

> Systematic accounting is shown to be in particular the product of Greek thought which laid the foundation of accounting science . . . In this paper the main thesis to be supported is that the double entry system of bookkeeping is a Greek invention and in the early years of Ancient Greece it had been applied in the presentation of transactions of the time. The Venetians had inherited from the Byzantines not only their commercial growth, but also their commercial methods. (1984/85, pp. 171, 172)

I by no means claim that the Italian double entry bookkeeping of the Renaissance is the direct descendant of the double entry token accounting of the Sumerians; I merely want to point to the possibility that the more fundamental input–output principle conceived by prehistoric man was the genuine ancestor of the logical structure encountered in the accounting systems of modern times.

Whether the type of double entry bookkeeping known to us from the civic stewards of Genoa, from Cotruglio and Pacioli or other historical records, is derived from ancient Grecian or Roman times, is another controversial issue. According to Filios many historians have supported the view that the bankers of Ancient Greece originated a systematized way of accounting:

> This is understood to be the advent of double entry accounting or at least of an accounting system which is based on the duality principle—the core of contemporary accounting. Thus debts were offset by capital transfers from one account into another. Several tens of historians have strongly supported this view like Guillard, Goldschmidt, Huvelin, Hasebroek, Eisler, Galhoun, and first of all Kraus already from the beginning of the eighteenth century. (1984/85, p. 178)

The qualification in the first sentence of the above quotation is crucial because, as we have seen, token accounting was already based on such a duality principle thousands of years before the banking system of Ancient Greece evolved in the temples of Delphi, Olympia, Delos, Ephesos and Corinth. And Filios (1984/85) admits that 'we should distinguish, first of all, between duality *concept* and the double entry technique' (p. 188). The duality concept of the Ancient Greeks may very well have been derived from that of the Middle East and handed on to the Romans and later to the Italians. But we have no hard and fast evidence that the double entry bookkeeping technique peculiar to Renaissance Italy was derived from ancient Greece or any other predecessor.

Something similar holds for Lall Nigam's (1986) claims asserting that the Bahi-khata double entry system of India preceded and inspired Venetian Renaissance bookkeeping: 'The Bahi-khata is a double entry bookkeeping that predates the "Italian" method by many centuries. Its existence in India prior to the Greek and Roman empire suggests that Indian traders took it with them to Italy' (p. 148). Lall Nigam does not offer a single piece of hard historical evidence for his claim. He merely states that 'it is difficult to pin down the precise period of the advent of Bahi-khata' (p. 149) and that 'the traditional Indian way of studying and teaching . . . [was] by mere word of mouth' (p. 150). But since the bookkeeping itself was done in writing, and since there are many other historical documents available from the Gupta to the Mogul period and beyond, some accounting records would have survived to substantiate at least part of Lall Nigam's claim. What Lall Nigam asserts cannot be taken as a legitimate historical fact as long as such evidence is not produced; and Nobes (1987) is quite correct in rejecting Lall Nigam's claim as being based on 'inexpert hearsay' (p. 183).

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ABACUS, Vol. 25, No. 2, 1989

WARREN P. HOGAN

Insider Trading: Implications and Responses

An understanding of the implications of insider trading can only be achieved by analysing conflicting perceptions of what is meant by inside or privileged information. Empirical evidence on insider trading, mainly reflecting United States experiences, challenges assumptions not only about the impact of insider trading but also the efficiency of financial markets. There are hierarchies of market participants and rules on insider trading capable of practical implementation will only change the rankings. Companies have a property interest in their inside information and should bear the responsibility for its use.

Key words: Efficient markets; Hierarchies; Insider trading.

Insider trading, thought of as the use of privileged information for securing a financial advantage, is widely held to be legally and morally wrong. The basis for this perception is not obvious. Constant repetition of this claim does not enhance its strength. The thrust of this paper is an analysis of the meaning of inside information and insider trading, an appraisal of the evidence on insider trading, and an assessment of what restraints on the use of information may mean for the working of the securities market.

The next section looks briefly at the role and significance of information in the workings of the securities market. This is followed by a spelling out of different perceptions of what is meant by inside information and its use as insider trading. The third section is devoted to an examination of the available evidence on the impact of insider trading. The great bulk of this material is drawn from empirical studies of activities in the United States. The fourth section brings out the many complications in the regulation of use of information in the securities industry. A fifth section treats the connections between owners, directors and management. The final section brings a wider perspective to the issues of restraining conduct.

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Assistance with data and sources provided by Alison Harvie is gratefully acknowledged. Professor Colin Simkin was generous with his comments and suggestions.

THE ROLE OF INFORMATION IN THE SECURITIES MARKET[1]

The perspective illuminating this paper is Hayek's (1945) analysis of the links between information and price setting. What Hayek drew attention to, even if sufficient heed has still to be taken of his contribution, was the inability of any one person to know everything bearing upon the use of resources at any one time. Hence the market reflects the interaction of many participants, each with knowledge of particular conditions of time and place. Accordingly there will always be some having rare or unique opportunities relative to other participants in a market. Experiences of markets reflect this point and are exemplified by propositions such as 'learning by doing'. The function of markets is to transmit information, through prices, on the relative demands for those items being traded. The more prompt the transmission the more effective is any one market in guiding the efficient use of resources.

Information is central to the efficient working of the capital market (Fama, 1970). In this context the concept of efficiency relates to the prices and values associated with all securities fully reflecting all available information. An efficient capital market is one in which prices are accurate signals for allocating financial capital to physical assets such as buildings, plant and equipment. This means, in turn, that the returns or rewards on any one security offered in capital markets will reflect the general level in the market adjusted for the risk associated with that security. That return is best conceived as a normal return. This does not mean that actual returns do not vary around that normal level; only that any departures from it are random, without persistent bias, positive or negative. This spelling out of the connection between information and the pricing of securities defines the efficient capital market hypothesis (ECMH).

Put at its strongest, the ECMH denies the possibility of an individual participant being able to earn consistently positive abnormal returns after taking into account transactions costs of trading. That interpretation rests upon all information, public and private, being available to market participants. A less demanding view, called the 'semi-strong form' of the hypothesis, refers to the efficiency of the market reacting to all *public* information. With this interpretation there is scope for earning positive abnormal returns at least for some brief period during which private information is acted upon. The third or 'weak form' of the hypothesis is of no interest for this assessment of insider information as it reflects participants being aware only of the historical behaviour of prices. The contrast between performances with the 'strong' and 'semi-strong' versions of the ECMH is the setting for examining the use of privileged, or inside, information.

THE CONCEPT OF INSIDE INFORMATION

Two distinct approaches to the defining of privileged, or inside, information may be identified. The first is best understood as reflecting property rights in information. The legal entity, whether corporate, partnership or individual, may use such information to its best advantage. The second approach reflects a principle of equality of access to information about securities.[2] That means having all participants, actual and potential, given the same opportunity to gain access to all information about any one security traded in a market. Notions of equity or fairness enlighten this approach to determining how privileged information may be used.

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[1] The treatment in this paper does not incorporate directly the dissemination of misinformation. However, the deliberate propagation of false information by participants, especially by those perceived as having access to privileged information, should be viewed as means for securing financial advantage.

The first approach defines inside information as information, not publicly available, whose use by a participant in a securities transaction is derived directly or indirectly from a fiduciary relationship and gives the participant and associates a financial advantage over others. The advantage may be secured from trading in the securities of the company in which the fiduciary relationship is established, or in other companies whose market values may be influenced if confidential information held by the initial company were acted upon. The latter aspect finds its most common expression in mergers and takeovers.

According to this definition, those having such information possess a property interest in it. The crux of the property approach is that the firm possessing the privileged information may determine how that information is used. With the main aim of the firm being the maximization of shareholders' wealth, the directors should be committed to using their privileged information to support that goal if they are to properly discharge their responsibilities. They may establish rules to protect the ways in which such information may be used by management and employees. The essence of this approach is that the nature and use of fiduciary relationships within the firm are determined by the directors who are answerable to their proprietors, the shareholders, for their actions. These determinations include the structure of remuneration to ensure that management acts as a faithful agent in the interests of the shareholders.

The second approach emphasizing equality of access to information about a company by all participants in a securities market sets aside the property concept. Information is not perceived as the property of the company being a legal entity, or as contributing to the wealth of the owners, being the shareholders. In effect the provision of equal access amounts to declaring all information a 'free good' to market participants regardless of the cost of its generation. Admittedly that cost may be exaggerated where the company requires information on its activities for management and audit purposes as well as for meeting reporting standards laid down by supervisory authorities. Such provisions are clearly different from the cost of information developed by a company about other companies in which it has competitive concerns or sees opportunities for acquisition.

With this approach the definition of inside information is any information, not publicly available, whose use by any participant in a securities transaction is to the financial advantage of that participant and associates over other participants. The breadth of this definition implies restraining use of any confidential information from whatever the source and however it was obtained.

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[2] This approach to defining inside information is based upon the principles underlying the analysis in a study for the National Companies and Securities Commission in Australia (1986). A critique of this study has been published elsewhere (Hogan, 1988).

Comparison of the two definitions shows the huge difference between them. The property approach is about using information, developed within fiduciary relationships of a company, to financial advantage. The equal access approach requires all information about all securities to be available to all participants, actual and potential, in the market. The former acknowledges the connection between information and the wealth of shareholders, whereas the latter denies its existence, or at the very least its primacy, for the workings of securities markets.

The property approach to defining insider trading leads to the claim that use of inside information means a rapid adjustment of securities prices to new equilibria. Rewards to the users of inside information, being positive abnormal returns, may be interpreted as a cost, borne by other participants to transactions, associated with the rapid transmission into market prices and values of this 'new' information.

The equal access approach would appear to lead to equitable and efficient market outcomes. Readily available information would be absorbed by participants, and its price implications understood, so that buyers and sellers would not gain or lose beyond general market movements. An initial response to this interpretation is to claim support for the approach in terms of the definition of the strong form of the efficient markets hypothesis. Reflection would point to the absence of any explanation of how participants would transform all the information into new prices. *There is no explanation for the adjustment process incorporated in this approach; recognition and then correct and complete use of the new information are assumed to take place instantly.*

In short, would there still be scope for some to earn positive abnormal returns? This question is not just about the efficacy of the efficient markets hypothesis. It is central to an understanding of complaints against the use of insider information.

EMPIRICAL FINDINGS

The actions of insiders as buyers or sellers convey information quickly to the market so that all participants are promptly informed by new price signals. An important element in the argument for the positive contribution of insiders is that costs of gaining access to information—search costs—are minimized for all participants. An understanding of the issues may be helped by an examination of the evidence from the many extensive analyses of insider trading pursued in the United States. In that country the Securities and Exchange Commission (SEC) requires persons having fiduciary responsibilities in companies or large shareholders to report share transactions. This information on persons defined as 'insiders' is available relatively soon after transactions take place.[3] Empirical work based on these data is comprehensive. The main purpose for assessing this public information is twofold; to establish the basis for analysing any gains enjoyed by insiders, as defined by the SEC, and test whether or not the availability of that information allows others to trade with equal or some advantage in the market.

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[3] Should insiders use dummies or nominees for trading in shares to disguise their participation, then the reported transactions would not fully reflect the extent of their activities.

Much of this work is relatively long-standing; earlier studies were summarized in a survey by Jaffe (1974). This was soon followed by another review which confirmed the role and significance of inside information in the workings of efficient markets (Finnerty, 1976). Attention is given in this type of empirical work to the complicated links between the provision of information by a variety of means and its uses.

One study, reported early in 1985, examined the relationship between insider trading and management forecasts (Penman, 1985). The results point to some gains by insiders. However, they do not appear to take advantage of all the information available to them when trading on the stockmarket. An important point in his conclusion was, 'even if insider trades do capture insiders' information, they are likely to be quite noisy signals due to trading for other than informational reasons' (p. 16). This aspect must be considered for its implications about the identification of just what is and what is not insider trading. Those with access to inside information will trade for a number of reasons such as liquidity and portfolio needs as well as tax influences. These features are noted frequently in commentaries on traders' activities whether they be insider, speculator or the ordinary participant.

Difficulty with interpreting the basis of trading by those having access to inside information is illustrated further by the results of a Swedish study of such trading in 1982. That study concludes that market returns on shares sold were higher than those on shares bought (Runfeldt, 1986, p. 127)! This evidence would suggest that influences other than access to confidential information dictated decisions about trading in securities.

At about the same time as the Penman study became available another paper was reporting on a somewhat similar theme. This work by Givoly and Palmon (1985) was about the exploitation of insider information. Apart from the excellent summary of issues at the beginning of the paper conveying much information on previous studies concisely, the study aimed at sorting out the extent to which abnormal positive returns reflect information available to insiders or the public disclosure of the specific news on which they acted, or were thought to have acted. On the basis of a very carefully developed methodology, devised to minimize the effects of extraneous influences, the authors reach some important conclusions:

1. Insiders' superior performance, represented by abnormal positive returns compared with the market return, is a reflection of market perceptions that they have superior knowledge to which investors respond;
2. The basis for this claim is that the abnormal return to insider transactions lasts well beyond a typical period of reaction to the disclosure of specific news about a company; and
3. Insider activities are seen as 'leading indicators' in the stockmarket so that other participants follow the lead initiated by insiders.

It should be noted that these results point to a market taking time to adapt to new information and thus being less efficient, in the sense of responsiveness to availability of new information, than is often claimed. This lag in response to new information has also been noted in the United Kingdom (King and Roell, 1988, p. 179).

This work of Givoly and Palmon challenges some preconceptions about the deleterious impacts of insider trading. It is commonplace to reject any benefits of insider trading on the grounds of undermining investor confidence. What their analyses show is quite the opposite. Far from undermining confidence, the activities of some insiders may sustain confidence in the stockmarket and the particular securities concerned; their activities being akin to specialist market-makers in a limited range of securities.

These results raise testing questions about the qualities of efficient markets directed mainly to the nature of expectations held by participants. The equilibrium condition for the efficient markets hypothesis rests upon the existence of homogeneous expectations amongst participants. The introduction of new information disturbs those expectations which means the creation of circumstances for earning positive abnormal returns. Outside a theoretical construction it would be bizarre to expect instant recognition of all the implications of new information by all participants. The Givoly and Palmon results point to an explanation of the adjustment process from one equilibrium to another; leadership is sought amongst a hierarchy of participants.

Similar studies have been pursued in an effort to determine what association exists between insider trading and information announcements. While the Givoly and Palmon study is most helpful, the work pursued by Elliott, Morse and Richardson (1984) is directed specifically to the question of whether or not insiders work on information available prior to public announcement. One important conclusion from their work was that only a small portion of the trading conducted by insiders was related to information later made public. Others bear upon claims about the impact of insider trading: (a) insider sales are less than normal prior to announcements of mergers and substantial increases in earnings; (b) insider trading may be related to other considerations such as portfolio diversification and taxes; and (c) the nature of the use of information is complicated, requiring careful interpretation. This result confirms points made earlier; detection of the influence of inside information on trading behaviour is no easy task.

The first of these three points bears directly on the asymmetry in use of inside information for trading purposes to which attention was drawn earlier. But this conclusion does not suggest that advantage is taken of information on successful outcomes to buy securities likely to rise in value; quite the opposite. Insiders rest, by and large, with their existing securities in the company anticipating the gains in wealth to be verified when the market reacts to public announcements. The second matter is one referred to already: those earlier comments on the variety of reasons why participants with access to confidential information trade in securities are reinforced. The third point bears upon the interpretation of information and the difficulty of deciding what is meant by using apparently relevant information.

The many analyses of trading information show how difficult it is, despite knowledge of certain defined insiders' activities, to reach firm conclusions on the extent to which abnormal positive gains reflect privileged knowledge. Within the very broad category of public investors not having access to privileged information, there may well be subgroups with trading performances at least equal to those of perceived insiders. This must be the important, if not the only, rationale for the growth of various managed funds. Moreover, recognition of different groupings of participants is important for understanding the incidence of transactions costs in securities markets (Joy and Jones, 1986).

PRICES AND MARKET ADJUSTMENT

Emphasis on the link between information and efficiency is now embedded completely in assessments of market performance. It permeates virtually all discussions on the supervision and regulation of markets, not least in the financial services sphere (Gilson and Kraakman, 1984). Within that context it is assumed that participants in the market not only use all available information, *but also use it correctly*. References to empirical studies and their results in the preceding section offer some insights on the extent to which markets perform efficiently in terms of prices as signals to market participants and the speed of response to new information reflected in price changes.

At issue in this approach to the analysis of markets is whether or not the information available to participants is used fully by them. If that information is not absorbed fully and accurately, or it takes time for it to be reflected in price changes, then the market is not fully efficient; it may then be possible for some participants to earn returns higher than would be the case in a market which met conditions for 'strong' efficiency in the sense of the ECMH.

Adjustment is about the adaptation of expectations to new information for the attaining of a new equilibrium. The equal access or fairness concept is the polar case; the adjustment process, collapsing to a 'one-off' price change, does not exist. It reflects the strong measure of market efficiency in its entirety. Readily lost from sight are the assumptions underlying strong efficiency; homogeneous expectations and instant recognition and response to new information. *That strong concept defines equilibrium, no more than that.* That is independent of questioning as to whether or not there is any basis for testing the efficient market hypothesis (Gross, 1986).

In the light of these restrictions, some questioning of the significance of the efficient market hypothesis for an understanding of the behaviour of financial markets is hardly surprising. For example, there is the possibility of uninformed participants not being able to recognize effectively their trading opportunities (Harding, 1982). What such a concern does enlighten is the likelihood of those participants being in a relatively weak position, whatever provisions are made about access to new information. It endorses the existence of a hierarchy of participants mentioned earlier when examining the results from the work by Givoly and Palmon. Lack of homogeneity amongst participants explains something about lagged price adjustments in securities markets and the relative efficiency of those markets but says little, if anything, about the influence of insider trading.

How would awareness of this new information to ensure equal opportunity be conveyed? Should it be preceded by an announcement that relevant information will be available to all and sundry at a specified time and place? That declaration of an impending relevant announcement could really influence trading, even if only by widening bid–ask spreads and such widening raises transactions costs to market participants. But a requirement for all public investors to have equal opportunities to obtain and evaluate relevant information goes further in terms of conduct with respect to trading in securities. Given the listing of some shares in a number of national stockmarkets, it would be impossible to offer equal opportunity to conduct securities transactions at all times. As the integration of national stockmarkets increases, such difficulties must grow with more and more trading across time zones and between locations.

A similar situation arises with the provision of information to organizations which analyse the performances and prospects of listed companies. Some are brokers seeking information on which to base their advice to clients. Others, not so closely tied to the stockmarket, offer a variety of specialized commentaries to individuals and companies. Major financial institutions, especially those managing insurance and pension funds portfolios, may seek information directly from companies. Then there are organizations, here and abroad, which 'rate' the quality of the various types of financial instrument issued by companies. These participants may receive information not in the public arena or well in advance of public disclosure. Yet determinations by these ratings organizations, when made public, can bring revisions to market prices for the company's shares and marketable debt.

Problems abound for implementing provisions about restraining the use of inside information. A brief reiteration of the main issue may help clarify the extent of the difficulties. Information would have to be posted, with defined insiders not able to trade the relevant securities for, say, a couple of days. But alert 'outsiders' would be able to trade immediately. Such a provision as proposed would have only one real effect: *it would change the order of those first able to act on the new information.*

Whose interest is then best served by changing the ranking order of those acting on ready access to information? The obvious beneficiaries of changing the ranking order would be the active participants in the securities market, the brokers and the fund managers. Where the broker acts as principal, rather than as an agent on behalf of clients, then the broker is competing with the funds in terms of market returns on assets. Knowledge of an impending announcement, combined with access to markets in which trades in relevant shares take place outside the ordinary hours of trading at the 'home' exchange, would offer a preferred access when compared with the ordinary participant tied to one location and time zone.

Whether or not changing the ranking order would reduce the potential for earning abnormal positive returns remains conjectural. But on the evidence adduced from various U.S. studies, the prospect for positive abnormal returns being earned, if only for a brief period, is real. Moreover, theoretical insights available from a spelling out of how adjustments take place in efficient capital markets suggest the availability of those short-term rewards.[4]

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[4] Nevertheless, the adjustment process is more complicated than just the price response. An optimal adjustment path is rarely considered. There is an implicit assumption that rapid adjustment of prices is the optimal procedure in securities markets. An essential element in any assessment of an optimal pattern of adjustment would be exposure of the minimal proportion of the shares outstanding to gains or losses before a new equilibrium was reached. The span of adjustment should account for relative scale of share trading as well as adaptation of prices.

The issue may be pressed further. Should there be a lapse of time between the date on which an insider could have traded, but is prohibited from doing so, and the date on which the information is generally disseminated, then more 'other parties' may have engaged in transactions at values different from the implicit new equilibrium set of values and prices fully reflecting new information. There will be costs to some participants because of prohibitions on the use of confidential information no less than the costs attributed to participants on the other side of a transaction with an insider. Hence Manne's (1966) critique of the alleged losses associated with insider trading may be extended further than he envisaged.

This situation reflects the existence of asymmetric information. Much depends upon the extent to which each participant in the securities market is aware of the conditions known to all other participants. Where participants possess similar knowledge, then they may expect a stable array of transactions costs with share prices reflecting risk premiums appropriate to each security on offer. However, this is not the case being treated here. This is a much less certain situation. Expressed in general terms each agent is not certain what other agents know, all the more so if each agent is not sure that every other agent knows what the agent knows. Such a position hampers the derivation of an expression of probable outcomes with effects on the pricing of all the securities to which this uncertainty applies (Postlethwaite, 1987). Perceptions of the appropriate risk premium may be misplaced, leading to a rise in transactions costs for most participants represented most obviously by widening of bid–ask spreads.

SHAREHOLDERS, DIRECTORS AND MANAGEMENT

Earlier the responsibilities of directors, acting on behalf of shareholders as owners for the ways in which the privileged information held by the company is used, were spelt out. Such information is the property of the company and its dissemination may contribute to maximizing the value of the firm, and hence, shareholders' wealth. Similarly, misuse of information may handicap a firm; for example, disclosure of information about clients might readily bring a loss of business.

Much of the relationship between owners and staff, especially senior management, has come to be explained in terms of agency relationships whereby explicit or implicit contracts are made to ensure that the person engaged acts in ways which are in the interests of the principal, in this instance the owners of the firm (Smith, 1987). The thrust of the analysis conveyed in agency theory is that delegation of authority to agents, in this instance senior management, has costs which reflect both the monitoring of contracts and departures from the optimal position desired by the owners.

The connection between these agency themes and inside information lies in the inducements by way of remuneration allowed to senior management. A criticism of legislative restraints on the use of inside information is that scope for offering financial inducements to senior management is reduced. This perception, mainly inspired by Manne, to whom reference has already been made, reflects both the gains in market efficiency arising from a rapid transmission of privileged information into market prices and the financial benefits accruing to senior management from acting with inside information.

The possibility of the gains from insider trading being part of a management contract, explicit or implicit, with senior staff brings into sharp focus the value of privileged information to the firm. The types of such information held within the firm bear upon the issue of how it may be used. Mention has already been made of the risks of loss of business should information on clients be used for securities trading. Another category of information is that developed within the company about other companies which may bear upon future competitive or acquisition strategies. With this type of information the interests of the company rest with control over its use lest competitors or target companies be identified through changed patterns of trading in shares prior to implementation of the company's own strategy.

However, the main focus of the concerns about the use of inside information has been on the shares of the company itself and the impact of insider trading on the company's market valuation. The interests of the company lie in sustaining market prices for its shares and debt instruments to ensure the raising of additional funds at the lowest costs. The briefings of brokers, fund managers and ratings organizations, to which reference was made earlier, illustrate the ways in which market participants are informed of the company's condition.

Insider trading by management need not support that funding goal. Trading may not only be in advance of an anticipated rise in the price of the company's shares subsequent to public disclosure of information, but also against expected falls. Moreover, this trading need not only be in shares; use of the derivative instruments in options and futures provides opportunity for relatively greater gains through leverage.

Two effects may be noted. First, should the insider trading bring greater volatility in share prices, the result will be a higher risk assessment of the company's shares and debt, so increasing the costs of raising new funds. In light of the empirical findings about the impact of insider trading, this effect may be all too easily exaggerated. The second element is the more testing. There are information asymmetries between management on the one hand and directors and, even more so, owners on the other. Where there are no explicit provisions about insider trading in management contracts, the directors, let alone the owners, need not necessarily know the basis for the trading pursued by management.

However, there are restraints on management. Management has its interests in maintaining the well-being of the company, all the more so if the human capital embodying management skills is in part firm-specific. Moreover, a manager's reputation is not enhanced by association with a weakened company.

Much of the concern about insider trading could be met by explicit contractual supervision and monitoring through directors acting on behalf of owners. Their interests lie in safeguards against the use of privileged information in ways which put at risk the market valuations of the company. This position has two clear implications; management contracts should be *transparent and complete* on matters of remuneration and boards of directors should have a majority of non-executive members, most of all in public companies with a diversity of ownership.

COMMENTARY

The two approaches presented to defining inside information, and thus insider trading, are polar views but ones which permeate discussion. Market practice wanders somewhere between them. At issue in contemporary discussions is the scope for regulatory measures for controlling the use of inside information to improve the efficiency of the securities market.

The startling feature of the controversy about insider trading is the lack of attention to empirical evidence about what takes place in financial markets. The great bulk of the evidence does not suggest the consistent extraction of positive abnormal returns by those having access to privileged information. Nor does it suggest that the exercise of inside information brings a rapid adjustment of prices to some new equilibrium. Instead, there appear to be categories or hierarchies of participants in stockmarkets rather than two groups: those having access to privileged information and the rest. The empirical studies do not reveal a *systematic basis* for rejecting the use of privileged information. Therefore the real objection to the use of inside information lies not in the apparent gains to those with preferred access but in the failure of insider trading to bring that prompt adjustment to prices which adherents claim to be its justification.

The practical handicaps to comprehensive policing of the use of inside information are immense and in all likelihood most costly. Implementation of a thorough equal access approach would deter rapid transmission of information by restraining discussion between market intermediaries and agents on the one hand and companies on the other. Any lesser provision on access would sustain a hierarchy of participants.

With companies having a property interest in the privileged information they possess, the responsibility for monitoring access to and use of that information lies with them. However, the existence of information asymmetries between owners and directors as compared with managers suggests the need for general rules to ensure effective monitoring of conduct by company officers and staff. Such provisions should be supported by measures to clarify, if need be, theft and misuse of intangible assets.

Nevertheless, those responsible for the conduct of stockmarkets and similar markets in derivative instruments such as options and futures have a compelling interest in sustaining the efficiency of these markets. Inhibitions on their main purpose, being the efficient pricing of the securities in which they trade, will foster searches for other means for the funding of real outlays. Hence enforcement of effective trading rules in these organized markets reflects qualities of self-interest akin to the property interests of owners and directors in the information held by their companies.

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ABACUS, Vol. 25, No. 2, 1989

JENICE P. STEWART

The Significance of an 'Orientation Postulate'

Until the 1930s, the 'orientation postulate' was a popular means of rationalizing bookkeeping practice. This was during a period when the balance sheet was the focal point of reporting and inductive theory formulation was popular in accounting. However, after the 1930s, the balance sheet was no longer the focus of financial reporting. By the 1960s accountants sought a deductive mode of theory formulation and the 'orientation postulates' were abandoned. Evidence adduced suggests that an 'orientation postulates' can be useful in addressing income statement as well as balance sheet issues, and is also useful in diminishing chaos and promoting logical and cohesive theory formulation. If a discipline has a common orientation, then less *ad hoc* principle formulation is likely to occur.

Key words: Accounting policies; Accounting theory; Principles.

Several writers have criticized financial accounting reporting for being misleading and not internally consistent (Briloff, 1969; Chambers, 1987). This study suggests that the cause of these criticisms might be diminished if an 'orientation postulate' were included in the accounting framework. Such a postulate has been suggested previously as a mechanism for giving accounting reports a more specific orientation, thereby reducing the criticisms arising from general purpose statements.

The most recent financial reporting framework embodied in the Statements of Financial Accounting Concepts—SFAC 1 (1978), SFAC 2 (1980), SFAC 3 (1980), SFAC 4 (1980), SFAC 5 (1984), and SFAC 6 (1985)—of the Financial Accounting Standards Board (FASB) continues to be plagued by criticisms (Dopuch and Sunder, 1980 pp. 1–21; Solomons, 1986, pp. 114–24) because the critics claim they lead to inconsistent and misleading financial reports. One of the most criticized, yet most important, financial reports is the income statement (SFAC 1, 1978, p. 1). If deductively derived principles were to have cured the ills of income reporting, then criticisms of earnings promulgations should have lessened when the Accounting Principles Board (APB) of the American Institute of Certified Public Accountants (AICPA) released Statement 4 in 1970. The criticisms of income reporting should have been further

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The author wishes to acknowledge the helpful comments of Gary J. Previts, Stephen A. Zeff, and participants at the research colloquiums of Case Western Reserve University in Cleveland, Ohio, and the University of Missouri in Columbia, Missouri.

minimized with the promulgations of the conceptual framework (SFAC 1–6, 1978–85). However, notions and calculations of 'income' have been and continue to be plagued with four issues which provoke criticism: definition, inclusiveness, classification and valuation.

The definition issue is frequently based on the difference between what accountants and economists define as income (see Parker, Harcourt and Whittington, 1986). For example, Hicks (1946, p. 172), an economist, defines income as the amount an individual can consume during a week and still be as well off at the end of the week as at the beginning. Accountants define income within the bounds of the cost, realization[1] and matching principles as all changes in equity except those resulting from investments by and distributions to owners (SFAC 5, 1984, para. 30). The second issue is the inclusiveness of earnings—should income include all changes in net assets (all-inclusive) or only operating or recurring income (current operating performance)? The third income issue, classification, centres on the taxonomy of income reporting. Should a dichotomous income statement be provided consisting of operating and net income (multiple-step) or should items be unclassified with emphasis on net income (single-step). The fourth earnings issue, valuation, is concerned with the question of whether income should be measured using historical cost or a current valuation technique.

One reason these issues continue to haunt the income statement after the development of two sets of accounting frameworks is because theorists failed to address the perspective from which accounting reports were to be prepared. It will be argued here that, because the accounting framework did not include an 'orientation postulate' (Zeff, 1961, p. 96–7; i.e., from whose perspective accounting information is to be prepared), its implications with respect to earnings are limited. Hence, in practice, earnings promulgations continue to be 'general purpose' and they are developed 'operationally' (Bedford, 1965, pp. 2–3) or inductively from practice.

Zeff (1961, pp. 96–7) defines an 'orientation postulate' as 'a statement of the point of view that the accounting process ought to assume'. A statement of the point of view would include a 'first subpostulate' subject and 'second subpostulate' beneficiary: the subject is the unit being accounted for; the beneficiary is the party for whose benefit the accounting statements are prepared (see Fig. 1). For example, the entity postulate might include the legal corporate entity as the subject and all suppliers of capital as the joint beneficiaries (Zeff, 1961, p. 96). In his dissertation, Zeff provided evidence that 'orientation postulates' are applicable to the income statement as well as to the balance sheet. Prior to his dissertation, the conventional wisdom was that 'orientation postulates' were applicable to the balance sheet only.

An 'orientation postulate' is an assumption that provides 'the first premise in a train of reasoning' (Zeff, 1961, p. 46). In 1958 the AICPA (1966, p. 63) defined postulates as scarce in quantity, developed from the socioeconomic environment and from the cultural background of all sections of the business community. They should serve as a

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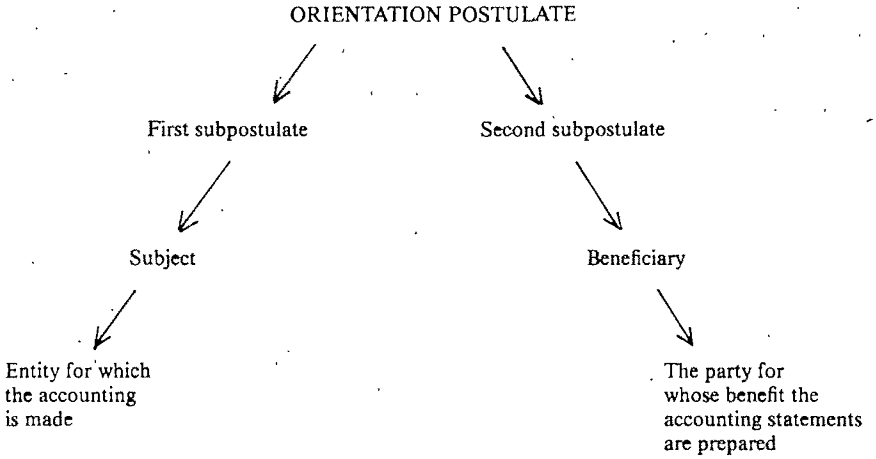
[1] The Realization principle is defined within the guidelines of APB Statement No. 4 as follows (paragraph 150): 'Revenue is generally recognized when both of the following conditions are met: (1) the earnings process is complete or virtually complete, and (2) an exchange has taken place'.

FIGURE 1


ORIENTATION POSTULATE
First subpostulate
Second subpostulate
Subject
Beneficiary
Entity for which the accounting is made
The party for whose benefit the accounting statements are prepared

framework for the solution of detailed problems and are 'interrelated and mutually dependent' (Zeff, 1961, p. 47).

In terms of theoretical structures, the term 'postulates' is used here to refer to basic propositions that have been derived after testing hypotheses regarding the socio-economic and political business environment. They provide the basic premises of a theoretical structure.

'Orientation postulates' were popular prior to the 1930s and during the era when the balance sheet was the focal point of reporting. However, when the income statement became the primary statement in financial reporting and deductive theory formulation was the vogue, 'orientation postulates' were referred to infrequently and not maintained consistently (Gilman, 1939, p. 50). It is argued here that an 'orientation postulate' has income reporting implications (Zeff, 1961, p. 8) as well as balance sheet implications. It is also argued that, if an 'orientation postulate' is included in an accounting framework and consistently followed, then the framework would be more useful as a guide for the development of income reporting methods.

OBJECTIVE AND SCOPE OF THE STUDY

The objective of this study is to articulate the reasons for including an 'orientation postulate' in an accounting framework if earnings issues are to be resolved. In accomplishing this objective, the scope is limited to two 'orientation postulates', entity (as presented by Paton, 1922, and Gilman, 1939) and proprietary (as presented by Sprague, 1908, and Hatfield, 1909). The fund postulate, advanced by Vatter (1947, pp. 75–6) and Zeff (1961, p. 174), is not included in the study because it includes no overt attempt to determine 'income'; nor is the consolidation postulate (Moonitz, 1944) included in the study because of the postulate's relatively narrow application to consolidated financial reporting. The commander postulate (Goldberg, 1965) is excluded because of its restricted relevance to managerial accounting.

As noted above, four accounting income issues continue to resurface in criticisms of reporting earnings. It will be argued that applying *both* the entity postulate and the proprietary postulate in the reporting of income, as is presently done, leads to inconsistencies in income reporting, reduces the credibility of earnings reports, and perpetuates criticisms of income on the four issues. The argument advanced is that income issues would be minimized if accounting principles were developed deductively from an accounting framework rather than inductively from practice. The two accounting frameworks included in this paper are the AICPA's Statement 4 and the FASB's Statements of Financial Accounting Concepts. It is argued that current criticisms of income reporting exist because these statements do not include an 'orientation postulate'.

'ORIENTATION POSTULATES' DEFINED

A survey of interpretations of the 'orientation postulate' provides the necessary backdrop and frame of reference for evaluating its application in accounting, particularly income reporting issues. The survey also shows that better ideas do not necessarily follow deficient ideas.

Historical Development of the Entity Postulate

The entity postulate is consistent with the conception of the charge and discharge statement (Peragallo, 1938). From the charge–discharge statement came the notion embodied in the entity concept of assets equal liabilities. The charge and discharge statement was most likely maintained on a cost basis (Gilman, 1939, p. 44). Because of this phenomenon, the cost principle is strongly advocated as an element of the entity postulate. However, neither the entity postulate nor the cost principle has been pervasive throughout time.

Three events seem to have caused the decline in popularity of the entity postulate. One, formal bookkeeping appears to have become almost extinct from AD 395, the time of death of Theodosius the Great, to the eleventh century (MacNeal, 1939, p. 58). Secondly, the 'orientation postulate' began changing from the recordkeeper (entity postulate) to the merchant owner (proprietary postulate). The Roman patrician was replaced by the merchant, and the recordkeeper was replaced by an impersonal trading firm. The merchant was regarded no longer as a creditor but owner of the firm (Zeff, 1961, p. 14). Unlike the recordkeeper who may have been subservient to the Roman patrician, the merchant controlled and financed much of the entity's operations.

The third event causing a temporary decline in the popularity of the entity postulate was a change in organized business activity. It has been suggested that with the growth of credit instruments and added safety on the roadways, merchants began to employ agents instead of doing the trading themselves. The sedentary merchant usually contracted a terminal (1–5 years) partnership with his/her agent—usually a family member (Zeff, 1961, p. 18). The family goal was the accumulation and preservation of the fortune of a large kinship group. As a result, the merchant became interested in the fluctuations in the value of his/her wealth. The popularity of the cost principle declined, with the support for current valuation as a measurement of owner wealth, after which the proprietary postulate became popular (Previts and Merino, 1979, pp. 169–70).

The entity postulate resurfaced, possibly because the proprietary postulate did not adequately depict the capitalistic type of enterprise structure. The evolution of capitalistic enterprises seems to have been instrumental in redirecting emphasis from merchants as economic citizens (i.e., merging of business and personal affairs in financial reporting) to merchants in their purely capitalistic, or enterprise, capacity. By the close of the nineteenth century accountants had begun to favour the separation of business from personal affairs in the United States and England (Zeff, 1961, p. 105). Consider, for example, the 1844 English Companies Act and the recognition in 1888 by the U.S. Supreme Court of the corporate entity as legally separate from its owners (Chatfield, 1977; Previts and Merino, 1979).

In 1811, New York enacted the first general incorporation law in the United States, recognizing the corporation as a legal entity separate from its creditors and owners. With the further development of the modern corporation, the business enterprise, rather than its owner, became the centre of accounting. This suggests that the entity postulate was more accommodating to the corporate statute.

Further support for the entity postulate occurred with the increased popularity of the cost principle and current valuation techniques were abandoned. The corporate enterprise was continuous rather than terminal, as characterized by the voyages and caravans of the earlier merchants (Zeff, 1961, p. 80). The cost principle was more amenable to the continuous recording of a firm's numerous assets for financial

FIGURE 2

NET REVENUE DIVISION, INCOME SHEET OF X CO., Dec. 31, 19–

OPERATING NET REVENUE	$	
Interest Earned		$
Fire Loss		
NET REVENUE TO ALL EQUITIES before deducting taxes	$	$
Interest on Mortgage Bonds		
Interest on Debentures		
Interest on Notes		
		$
Federal Income and Profits Taxes		
		$
Preferred Dividends		
NET BALANCE FOR COMMON STOCK		$
Common Dividends		
Undivided Profits		$
Surplus Balance, Jan. 1, 19–		
		$
Reserve for Contingencies		
TOTAL UNAPPROPRIATED SURPLUS, Dec. 31, 19		$

Reprinted from Paton's *Accounting Theory* (1922, pp. 269–70).

reporting than the current revaluations used at the conclusion of a voyage. The entity postulate emerged as an attempt to 'rationalize capitalistic bookkeeping transactions' (Newlove and Garner, 1951, Vol. I, Pt 1).

In the United States, Paton (1922) was the first accounting theorist to emphasize and present the entity postulate—that is, to conceptualize the enterprise as a distinct entity or personality (Zeff, 1961, p. 95). From that time writers presented their own interpretation of the entity postulate.

Paton's (1922, pp. 16, 24, 28) conception of the 'orientation postulate' (entity postulate) implied the business enterprise as the first subpostulate and the equities as the second subpostulate (Chapter 4). The balance sheet, considered by many as more important than the income statement (p. 20), was seen as a comprehensive statement of the assets and equities of an enterprise (p. 44). Paton considered liabilities and capital as equities because both represented rights in the assets of a corporate enterprise (pp. 67–8). This viewpoint was consistent with the legal business entity which the state had sanctioned with a personality separate and distinct from its owners. The law also treated shareholders and creditors as equity holders in the corporation. Consistent with modern finance theory, the only 'real' distinction between creditors and owners was the amount of risk associated with each (pp. 72–5). Additionally, all transactions were reduced to terms of increases and/or decreases in assets and/or equities. Thus, equities and assets were the common denominator of business transactions of a corporate enterprise.

Paton further substantiated his conception of 'assets = equities' in the income statement. He viewed revenue and expense classifications as subsidiary divisions of equity. Interest repayment, taxes payable and dividends to stockholders were treated as distributions of capital and were not used to calculate net income. Losses and gains accruing through several accounting periods were to be closed to the surplus (capital) account. All other revenues, expenses, gains and losses were to be closed to the profit and loss account (pp. 175–90). See Figure 2 for a comprehensive illustration of the income statement prepared under the entity postulate.

Paton's conception of the entity postulate also supports the realization (pp. 444–65), going concern (p. 478), and cost (pp. 364, 442) principles. Many theorists agreed that the entity postulate implied cost valuation (Hatfield, 1927, p. 66; Gilman, 1939, pp. 440, 55–6). However, this now appears to be the only 'officially' endorsed income reporting assumption to arise from the entity postulate (Paton, 1922, p. 489; Gilman, 1939, p. 44).

The entity postulate lost whatever popularity it had in the 1930s. Greendlinger (1923, p. 365) provides evidence of more emphasis on earnings per share (income reporting) and less emphasis on dividends paid (balance sheet) as a measure of corporate performance, factors that possibly led to the diminishing popularity of the entity postulate.

Historical Development of the Proprietary Postulate

The proprietary postulate arose from attempts to explain the origins of double entry bookkeeping (Hendriksen, 1970, p. 30). It was based on the use of the balance sheet to provide a measure of the owner's wealth (Previts and Merino, 1979, p. 176). Under the proprietary postulate, the proprietor is the central figure—that is, the proprietor owns the business assets and owes the business liabilities (Sprague, 1908, pp. 46–7). Accounting practice commonly associated with the proprietary postulate is that of the medieval merchant and the fifteenth-century bookkeeper (Zeff, 1961, pp. 100–3). Medieval accounting emphasized the owner's viewpoint of record keeping and the balance sheet. During the medieval period, accounting was a private matter for the owner–manager's use only. Merchants merged their business and personal affairs into the same set of books in order to calculate the worth of all their properties. Profit measurement was subordinate to ascertainment of the capital account balance (Zeff, 1961, p. 22). The proprietary postulate is thus associated with the equation: total assets less liabilities equals proprietorship interest.

Although the proprietary postulate was said to have reflected business practice during the Middle Ages as well as during the fifteenth century, 'orientation postulates' were not consistent within both time periods. The medieval merchant, whom Paton (1922, p. 63) labels the 'economic citizen', merged business and personal affairs (Zeff, 1961, p. 97) and was, thus, both the subject and beneficiary of financial reporting. He was almost exclusively interested in changes in net worth (Zeff, 1961). That is, merchants looked to the balance of, and changes in, their capital account for indications of status and progress. The balance sheet emphasis and appraisals of assets as an indication of change in owner wealth pervaded fifteenth-century bookkeeping. In essence, both the medieval merchant and venture traders viewed profit as the net increase or decrease in changes of their appraised wealth (Zeff, 1961, pp. 100–3).

By the late 1800s, the owner was still the central figure of financial reporting but as a proprietor, separate and apart from his personal affairs, not as an 'economic citizen'. The proprietary postulate during this period was presented in complete form by both Sprague (1908) and Hatfield (1909) with the balance sheet as the focal point of financial reporting (Hendriksen, 1970, p. 30).

Sprague (1908, p. 20) defined the accounting equation as 'Assets = Liabilities + Proprietorship'. The balance sheet was prepared for the benefit of the proprietors, who are distinguished from their creditors. Other economic factors also necessitated the separation of liabilities from proprietorship. For example, the owner had control over assets while the creditor did not, and losses and expenses were the responsibility of the proprietor only (Sprague, 1908, p. 47).

Sprague also included the adoption of periodicity and accretion in assets as part of the proprietary postulate. The income statement included accretion in the value of assets and profit and loss accounts were viewed as subordinate to proprietorship (Sprague, 1908, pp. 54–9; Hatfield, 1909, p. 197). Sprague's representation of the profit and loss statement under the proprietary postulate appears in Figure 3.

The proprietary postulate could reasonably be inferred as the basis of accounting practice up to the twentieth century. During the early 1900s, the period of industrial growth, capitalists appear to have believed that the fastest way to increase their wealth was through capital accumulation, not annual earnings (Previts and Merino, 1979, p. 167), and they also felt a need to preserve their capital. As a consequence, corporate accountants were given the responsibility of computing retained earnings available for dividends while ensuring that invested capital was maintained after fixed asset balances had been depreciated as expenses (Previts and Merino, 1979, pp. 169–71).

After the 1929 stock market crash, investors perceived net income as more useful than dividends in assessing an entity's future earnings power, with the concomitant outcome that the income statement became more important than the balance sheet (May, 1936, pp. 65–6). Since the proprietary postulate underpinned practice when the balance sheet was the emphasis of financial reporting, the proprietary postulate was apparently abandoned when the income statement became the focus of financial reporting in the 1930s (Gilman, 1939, p. 430; Previts and Merino, 1979, pp. 168–74). By the 1930s the cost principle had been adopted and appraised valuation abandoned because, some claimed, it lacked objectivity (Previts and Merino, 1979, p. 231).

FIGURE 3

PROFIT AND LOSS

Outlay		*Income*	
Salaries	$ 4,000.00	Profit on Sales	$15,520.66
Delivery	987.56	Interest	150.00
Insurance	169.50	Rent	240.00
Interest	387.50		
Taxes	151.42		
Repairs	232.19		
Fuel	365.00		
Light	279.50		
Supplies	463.84		
	$ 7,036.51		
Net Profit	*8,874.15*		
	$15,910.66		$15,910.66
Dividends, $10 per share	$ 6,000.00	Net Profit, brought down	$ 8,874.15
Carried to Surplus	*2,874.15*		
	$ 8,874.15		$ 8,874.15

SURPLUS

1907		
Jan. 0	Balance	$11,468.43
Dec. 31	Profit	2,874.15
		$14,342.58

Reprinted from Sprague's *The Philosophy of Accounts* (1908, pp. 72–3).

By the 1940s the proprietary postulate had been de-emphasized, probably because it failed to reflect current financial reporting practices. Income reporting included the entity postulate (i.e., cost principle and corporation viewed as a separate legal entity) and the proprietary postulate (i.e., assets less liabilities equals owner's equity). The entity and proprietary postulates reflect different economic and legal arrangements. Accordingly, no one 'orientation postulate' can be expected to encompass all current accounting practices. However, as Gilman (1939, pp. 50, 54) and Newlove and Garner (1951, pp. 20–4) have contended, adhering to the proprietary postulate in some cases and the entity postulate in others will result in inconsistent financial reporting.

INCOME REPORTING ISSUES

The following review of current income reporting problems (1960–80) is used to illustrate the application of the entity or proprietary postulate as a possible solution. Although no one 'orientation postulate' is likely to solve all the ills of current income reporting practices, it is suggested that practice can at least be consistent, and thus more reliable where only one theory of income reporting is accepted. The following sections include a definition of the income reporting issues, as well as possible solutions, if an 'orientation postulate' were included in the conceptual framework. One income statement issue that is addressed as problematic and that might be solved by accepting an orientation postulate exclusively is the valuation problem.

Valuation Issue

The position taken is that the current valuation dilemma results from the difference in economists' and accountants' views of income. Accountants, after the 1920s, favoured cost-based income measures because they were definite and, once incurred, unchangeable (Littleton, 1928, pp. 278–88). Sanders, Hatfield and Moore (1938), the Executive Committee of the American Accounting Association (1936) and the ICAEW (1944) all contended that accounting is an allocation of historical costs and revenues to the current and succeeding fiscal periods and not a process of valuation. Reliability and objectivity are essential reporting criteria; therefore, cost-based reporting dominates accounting practice. Economists disagreed with, and criticized, accounting concepts of income (Fisher, 1924, pp. 64–7). Economists leaned toward a current valuation basis of income determination that included subjectively derived changes in asset values (Canning, 1929; Alexander, 1950, pp. 1–95 at p. 15).

In the 1960s accountants became concerned that historical cost-based income measures no longer fairly presented earnings (Chambers, 1965, pp. 731–41). The value of the dollar was declining so quickly that historical cost was not considered relevant in calculating income. The APB issued Statement 3 in 1969 (AICPA, 1962–73), which recommended that in addition to historical costs, earnings restated in terms of general price level changes were to be disclosed.

Again in the late 1970s and early '80s (another inflationary period), accounting regulatory bodies were concerned that historical costs were not as useful to investors, creditors and others as some form of current costs in assessing an entity's income. In Statement 33 (1979), the FASB required companies that met specific size tests to disclose supplementary (earnings) information on a constant dollar basis and a current cost basis.[2]

More recently, the conceptual framework (SFAC 5, 1984) has advocated two valuation methods—historical and current cost—whichever is the more relevant and reliable. However, unless supported by the inclusion of an orientation postulate, the FASB's support of historical and current cost data could be interpreted as creating confusion and inconsistency.

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[2] SFAS 33 was rescinded in late 1986. Tweedie and Whittington (1984) list similar developments in other countries in the 1970s and 1980s.

The entity postulate and the proprietary postulates have been considered above. If one of these were placed formally within the accounting structure, then accounting regulatory bodies would have logical and theoretical support for historical costs, current values or both. Some claim that the entity postulate would lead to valuation at cost (Paton, 1922; Gilman, 1939). Accordingly, it would be argued that cost is the 'entry price' to the subject (business entity) of financial reporting (first subpostulate) and is useful and relevant to the beneficiary (equity holders).

Under the proprietary postulate, income measurement is a function of asset valuation (Hendriksen, 1970, pp. 496–7). Because income is viewed as arising from appraised changes in asset values (Hatfield, 1909, p. 197), income measurement should be articulated with the valuation basis of assets. Philips (1963) described this as the accretion concept of income. Further, he contended (pp. 14–25) that the accretion concept of income will parallel economic reality and is a reasonably objective measurement. He further stated that measurability, not realization, should be the basis for the income calculation and, in essence, that the proprietary postulate dictated an 'articulated'[3] financial reporting with some form of current valuation used consistently in measuring assets and therefore earnings.

What the above analysis suggests is that if an 'orientation postulate' were adopted, income would be presented on a consistent basis. The entity postulate would support historical cost and the proprietary postulate would support current valuation as the bases for income measurement. However, only one 'orientation postulate' can be used for the determination of income if consistent reporting is to be achieved.

Inclusiveness of Income

Zeff claims (1961, p. 149) that the controversy of all-inclusive[4] versus current operating[5] income reporting originated as the difference between the British and American concepts between the 1930s and 1950s. The surplus or current operating viewpoint is identified with the English mode of thinking, whereas the 'comprehensive income' or all-inclusive viewpoint represents American thought. In the United States, income was defined in terms of capital value or increase in wealth (May, 1936, p. 32). Americans viewed the owner as an integral part of the entity and saw profit determination as an increase in one's (the owner's personal and business assets) wealth. Because the British viewed the entity as separate from its owners, their concept of profit and loss results in only the ordinary operations of a business entity for the year being reported. These two views or concepts of earnings are said to have developed from the adoption of different 'orientation postulates' (May, 1936, pp. 92–105).

Kiger and Williams have reported on the voluminous number of published accounts during the period 1953–66 (1977, p. 67). During that period, the number of corporations reporting special items and the number of special items decreased significantly (see AICPA, 1953–66). Approximately 65% of special items are disclosed under the all-inclusive concept and 35% under the current operating performance concept (Kiger and Williams, 1977, pp. 63–77). This reflected a movement from current operating income to the all-inclusive earnings report advocated by the APB.

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[3] The statement of earnings 'articulate' with the statement of financial position in the sense that they are both part of the same measurement process (Belkaoui, 1981, p. 82).

[4] The all-inclusive advocates argue that extraordinary as well as all revenues, gains, expenses and losses should be disclosed in the income statement.

[5] The current operating income advocates argue that extraordinary, nonoperating and/or nonrecurring income items should be disclosed in the balance sheet under the caption 'retained earnings'.

The APB (AICPA, 1962–73) supported all-inclusive income reporting in Opinion 9 (1966). It wanted to include ordinary as well as extraordinary items in the income statement. Although prior period adjustments were not to be included in the earnings report, they were defined so precisely that such adjustments were considered by the APB to be rare (Kiger and Williams, 1977).

Proponents of the APB's all-inclusive concept of 1966 argued that if extraordinary items were not disclosed in the income statement, then managers and/or the independent auditor might manipulate earnings figures. It was argued that an income statement which disclosed all earnings charges and credits occurring during the year is simple to prepare, easy to undersand and subject to consistent interpretations when applied to the treatment of individual items. It was also contended that earnings statements should not be based on the current operating concept because such an income presentation would be of limited usefulness in forecasting the earnings power of the enterprise. Instead, it was suggested, unusual and extraordinary items were an integral part of a company's earnings history and should thus be placed or arrayed in the earnings statement. Warnings were also sounded that if extraordinary items were excluded from the income statement, then they would possibly be overlooked when reviewing the operating results.

Advocates of the current operating concept (e.g., Montgomery, 1912; Kester, 1933; AICPA Committee on Accounting Procedures, 1961) reasoned that presenting extraordinary items in the income statement could distort earnings because many users are not informed enough to analyse statements and know the significance of unusual and/or extraordinary items. The current operating proponents also explained that management and the independent auditor are in a better position than outsiders to determine whether an item is extraordinary. Additionally, they argued that the disclosure of extraordinary items in the income statement may impair the significance of net income to the extent that misleading inferences might be drawn from a net income number that included extraordinary items (AICPA, 1961).

As evidenced from SFAS 16 (1977), which limits further those items that can be charged directly to retained earnings, there was a shift away from the current operating income statement to an all-inclusive single-step income statement. This has resulted from the FASB's response to changes in the business and socioeconomic environment, perceptions about the limitations and nature of financial reports and user needs, and the want to limit perceived abuses in financial reporting (SFAC, 1984). The all-inclusive income statement is intended to avoid disclosure of discretionary losses or gains from outside an income statement, thereby avoiding the presentation of a more (or less) favourable report of management performance than is warranted. However, because income statements are used as a basis for forecasting future performance and assessing future cash flows, arguments have been advanced supporting exclusion of unusual or nonrecurring gains and losses that might reduce the predictive ability of an income statement for any one year (SFAC, 1984). A possible

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solution to the inclusiveness controversy is the adoption of an 'orientation postulate'.

The entity postulate views the firm as separate from its owners and only the firm's assets and equities are included in its accounts. The earnings statement is subsidiary to the equity account (Paton, 1922, p. 142). A strict interpretation of Paton's concept indicates that all revenues, expenses, gains and losses should be disclosed in the income statement as well as all distributions of capital (e.g., interest expense, federal taxes and dividends payable) and reserves for contingencies. However, income items accruing over several accounting periods and recognized in another period would be categorized as a surplus or capital item (p. 176). In essence, net income would represent the increase or decrease in equities of the current period exclusive of equity distributions (pp. 168–76).

Under a proprietary postulate the earnings available for the sole benefit of the proprietor would be reported (Sprague, 1908). The owners are assumed to want to know how much better off they are at the end of a reporting period. Hendriksen (1970, p. 497) contends that the all-inclusive concept of income is founded on the proprietary postulate because net earnings would include all transactions affecting proprietorship during the period, except dividend and capital transactions. Thus, all items of profit or loss would be counted in the change in capital including unrealized and realized changes in the current valuation of assets. The income statement under the proprietary postulate would then be an all-inclusive supporting schedule of the change in the proprietor's wealth. It appears, therefore, that the earnings content issue could be resolved if an 'orientation postulate' were adopted in the financial reporting framework.

Classification: Single-step or Multiple-step

The proprietary and entity postulates imply that different items of income are to be presented in the earnings schedule but may still be considered to be insufficiently discriminating in determining what is and what is not to be included. The income statement would then be comprised of different kinds of income and capital items (e.g., recurring income items and nonrecurring income items). If the proprietary postulate were accepted, then net income would include realized as well as unrealized gains and losses. If the entity postulate were accepted, net income would include operating and non-operating income (loss). This suggests that the adoption of an orientation postulate may require a taxonomy or classification scheme. The current income classification issue follows, along with the suggested presentation described from the 'orientation postulates' included in this study.

The classification of earnings seemingly became an issue after the 1929 stock market crash. In the 1930s, earnings became the major focus of financial reports (Gilman, 1939) as investors realized that forecasting the profitability of an entity required not only an analysis of working capital, but earnings too (Paton, 1922; Graham and Dodd, 1951). Paton has already indicated that a recurring–nonrecurring earning classification would be useful in assessing future earnings. Subsequently, accounting regulatory bodies began to take a gradual approach towards separate disclosure of nonrecurring items. The AICPA Committee on Accounting Procedure (1953) required separate disclosure of one of the easiest (in terms of objectivity) to identify nonrecurring items, 'material extraordinary charges and credits'. In Opinion 9 (1966) the APB required disclosure of extraordinary items, in Opinion 20 a change in accounting principles, and in Opinion 30 unusual-in-nature items, items infrequent in occurrence and discontinued operation items. This group of promulgations represented a piecemeal approach to a recurring–nonrecurring income statement classification issue. The approach has led to an earnings classification scheme that is still being critized because it discloses only nonrecurring items that are readily distinguishable. For example, some items of income are recurring, but the volatility of the items may be random, and therefore the unsystematic portion of a recurring item is nonrecurring (FASB, 1979, p. 1). Although the random fluctuation of a recurring item may not be readily distinguishable, this may not be sufficient justification for it to be classified as part of recurring income.

By the 1970s, there was a perceived need for the accounting profession to reassert its belief in self-regulation of accounting matters (Previts and Merino, 1979, p. 308). The APB had not obtained the confidence of the Securities and Exchange Commission or the profession (Previts and Merino, 1979, pp. 285–91). After the deliberations of the Wheat Committee (1972), the FASB was established to give the accounting community a positive sense of self-identity. The Trueblood Committee (1974), as well as the FASB, agreed that the objective of financial statements and reporting should be 'to provide information useful in assessing an entity's future cash flows'.

Many users had complained that the currently accepted unclassified earnings presentation was not useful in assessing cash flows. It was suggested that the currently accepted earnings model (single-step or nonclassified) was nothing more than mere computations that presented the change in earned capital which may not be sufficient to satisfy user needs. Hendriksen (1970, pp. 147–8) contended that the advantage of classifying income charges and credits as recurring and nonrecurring was based upon the improved usefulness (predictive ability) of the income number. Recurring events, generally, were said to be more useful in predicting future cash flows than the then disclosed net income figure (Hendriksen, 1970).

The controversy regarding the most useful earnings format was also addressed by the FASB in its Discussion Memorandum on *Reporting Earnings* (1979). The FASB stated that regular (recurring) and irregular (nonrecurring) income classification disclosed information on the uncertainty of cash flows. Other advantages of a recurring–nonrecurring earnings classification, claimed by the FASB (1979), included better assessments of changes in the quantity of activities and of the influences of changes in the corresponding levels of revenues and expenses. As well, disclosure of corrections of past estimates (a nonrecurring item) were claimed to be useful for the prediction of future earnings. Further, users complained that the financial reporting of unusual costs or revenues camouflaged them. This problem, it was contended, could be reduced or eliminated if unlike (i.e., recurring vs nonrecurring) items were separately disclosed (Strauss and Arcady, 1981).

The Board suggested that there were many advantages associated with a classified income statement. One advantage would be less tendency for the user to focus on the bottom line; although more recent accounting methods may have the effect of increasing the volatility of earnings measurements (e.g., research and development costs, SFAS 2, foreign currency translation transactions, SFAS 12, and prior period adjustments, SFAS 16; FASB, 1979, p. 1). None of those items is separated clearly in the income statement from the effects of events that have a more regular pattern over time (SFAC, 1984). That is, analysts and accountants complain that the current earnings disclosure (nonclassified) does not highlight components of income that may be more useful in assessing future cash flows than a composite net income figure (Mortimer, 1979, p. 68; Strauss and Arcady 1981, pp. 66–77). Classification would also facilitate financial statement analysis by grouping items with similar characteristics such as continuity of recurrence (which is likely to have more predictive value than if their characteristics were dissimilar), and separating items with different characteristics (FASB, 1979). Classification may also serve to emphasize the importance of subsets of earnings rather than focusing on the bottom line (FASB, 1979). The Board (1979) contended that historically, changes in the income statement have evolved slowly over time.

The Board excluded certain accounting adjustments of earlier periods recognized in the current period as a part of earnings but defined them as a part of comprehensive income. If SFAC 5 (1984) implies an all-inclusive income presentation, then it could be claimed that the Board has partially advocated the proprietary postulate. That is, an unclassified income statement and income defined as the change in net assets.

Under the proprietary postulate, Sprague (1908, pp. 72–3) asserted that profit and loss classification depended upon viewpoint and if accounts, accounting methods and classifications were developed and explained solely from the proprietor's viewpoint, a non-classified income statement was the result. However, the author as well as Newlove and Garner (1951) disagree. Since earnings would include both realized and unrealized income, and as these are unlike income items, they should be classified accordingly. At least the proprietary postulate is not inconsistent with a realized–unrealized classification of income. Furthermore, it could be argued that a proprietor might be concerned with which earnings transactions have been realized and which are 'merely' book entries (Newlove and Garner, 1951).

Managers appear to be the primary beneficiaries of income reporting under Paton's perception of the entity postulate. This perception would support an income statement classified on the basis of operating vs nonoperating items. In fact, Paton (1922, pp. 269–70) included such a taxonomy in his illustration of an earnings report. Further, Hendriksen (1970, p. 144) contended that if the managers are the primary beneficiaries, then an operating–nonoperating income taxonomy is appropriate. Paton also argued that 'income distributions' should be incorporated as a taxonomy in the income statement but not used in computing net income. He included interest expense, income tax expense and dividends payable in the income statement as distributions of income, but not as part of income determination.

In conclusion, it is argued here that the entity postulate leads to an operating–nonoperating classification, whereas the proprietary postulate requires a realized–unrealized classification. This conclusion does not mean that acceptance of one of these 'orientation postulates' is necessary for an accounting framework to have income reporting implications. Rather, if an 'orientation postulate' is included in the accounting structure and is used consistently in income reporting promulgations, then income reporting methods would be less misleading and more consistent.

Definition of Income: Accounting vs Economics

Some have argued that the conceptualization of accounting income was derived from the economists' concept of income. Early economists attempted to explain entire systems of logic about human behaviour through deductive reasoning (Canning, 1929, relying heavily on Fisher, 1906). Prior to the 1930s, accountants were said to have no comprehensive philosophical system of thought about earnings (Canning, 1929). This may be because early writers on accountancy were generally without academic accounting education and their writings were mere descriptions of bookkeeping practices. When accountants initially received academic training, it was in the area of economics. Understandably, as their teachers had obtained an economics degree, accountants tended to follow methods of economics and attempted to develop accounting income concepts accordingly.

Accounting income is said to be similar to economic income in that there is the acceptance of the 'service-output by customers at a price and there is the preparation of the service-output for customers at a cost' (Littleton, 1937, pp. 13–22). Littleton (1928, pp. 278–88) contended that economists and accountants use the accretion concept of income, that is, the change in net assets (accounting) or wealth (economics). It should be noted that the accretion concept was popular in accounting when the balance sheet was emphasized and business ventures were short-term, but this concept is no longer as popular with the current emphasis of financial reporting on the income statement and long-term corporate enterprises. Therefore, while accounting and economic income have some obvious similarities, it might be argued that there are also many dissimilarities.

Canning (1929) explained why there is dissimilarity between accounting and economic income. Unlike economic income, accounting income was developed within statistical, quantitative bounds. The accountant was considered an agent of the client within the corporation for the sole interest of the proprietor. The accountant was concerned with the income of an enterprise rather than that of society. Economists conceptualized 'earnings' whereas accounting income was generally an explanation of practice. Economic income was considered with respect to the capital yielding whereas accounting income was calculated with respect to the owner receiving it (that is, not the source of income but how much income there was). Accountants were, and are, constrained by their socioeconomic and political environment. They adhere to notions such as objectivity, periodicity, corporate charters, stock indentures and by-laws. Canning further concluded that because of these constraints and the complexity of the corporate asset structure, accountants adopted historical cost as the basis for deriving a measure of income. Cost is claimed to be objectively determined and is supported as a measuring stick by much of society. The economist, on the other hand, is not bound by a client and therefore is less constrained by the environment. Economists may recognize all gains in their models, realized and unrealized, expected and unexpected. Accountants generally exclude recognition of unrealized gains on the grounds that they are not objectively determined and, thus, are not supported within the accountant's political and social environment. Accounting practices owe more to their immediate environment than detached philosophic reasoning (Bornemann, 1943, pp. 321–3).

The adoption of an orientation postulate would assist in providing solutions for income reporting issues. The orientation postulates represent a basis upon which bookkeeping transactions may be rationalized. However, as Newlove and Garner (1951, pp. 20–3) contended, accountants either consciously or unconsciously select an orientation postulate when addressing financial reporting issues. Two different orientation postulates do not, however, offer a common meeting ground (Newlove and Garner, 1951). Therefore, if accountants are not persistent in holding to one or the other, their conclusions as to matters of interest are likely to be inconsistent and unreconcilable.

SUMMARY AND CONCLUSIONS

From the historical review of the problems related to income reporting, a step toward solving income statement issues is to decide from whose perspective financial reporting is aimed. That is, the theory and principles and methods of accounting should be developed from a conceptual framework or theory of financial reporting that includes an 'orientation postulate'. The FASB has taken a step in pursuing such a task with the issuance of SFAC 1–6. However, there is no mention of the perspective from which financial reports are to be prepared. Rather, the Board has stated that its objective is to 'provide information useful to users in assessing cash flows'. Of course, neither the proprietary or entity postulates of income will solve all periodic income reporting problems; however, principles for determination of accounting income would be built upon a stronger base and possibly visualized as more creditable to the public if one 'orientation postulate' were exclusively accepted and used as a means of reporting income.

Some of the shortcomings of income conceptualization and reporting with respect to valuation, inclusiveness, classification, and definition have been discussed. It has been suggested that one means by which the credibility of the income statement can be strengthened, and certain problems lessened, is to determine from which 'orientation postulate' earnings are to be reported. This implies that interest expense and taxes would be considered distributions of net income rather than being included in determining net income. Thus, the entity postulate would include income reported on an operating–nonoperating classification. The entity postulate would also include an historical cost-oriented definition of income whereby only realized income would be included in earnings.

Although both postulates were developed prior to the 1930s, they can be adapted to financial reports that consider the income statement as the focal point of financial reporting. Accepting an exclusive 'orientation postulate' should lead to consistent and reliable financial reporting.

It was noted that in both 'orientation postulates', no mention is made of income. This is because the income statement was not a focal point of financial reporting until the 1930s, at which time the 'orientation postulates' lost their popularity in accounting circles. However, the income statement is included in both 'orientation postulates' as supporting schedules of the change in equities (entity postulate) or proprietorship (proprietary postulate). Under the proprietary postulate, income would be valued or determined as a function of asset valuation. Since the proprietary postulate advocated the accretion concept of income, income would be reported on some current cost basis including realized and unrealized income. The income statement would be an all-inclusive supporting schedule of the change in net assets. Since earnings would include realized and unrealized income, it is contended that proprietors would support an income classification on an equivalent basis, that is, realized–unrealized. Proprietary conceptualization of income would be somewhat like that of the economist, the change in net assets excluding owner withdrawals and contributions.

The entity postulate would not support some form of current costing as a means of asset valuation. Rather, income would be measured at cost. However, like the proprietary postulate, the entity postulate would advocate a supporting schedule on a hybrid all-inclusive basis as an explanation of the proprietor. The accountant was concerned with the income of an enterprise rather than that of society. Economists conceptualized 'earnings' whereas accounting income was generally an explanation of practice. Economic income was considered with respect to the capital yielding whereas accounting income was calculated with respect to the owner receiving it—that is, not the source of income but how much income there was (Canning, 1929). Accountants were, and are, constrained by their socioeconomic and political environment. They adhere to notions such as objectivity, periodicity, corporate charters, stock indentures and by-laws. Canning further concluded that because of these constraints and the complexity of the corporate asset structure, accountants adopted historical cost as the basis for deriving a measure of income. Cost is claimed to be objectively determined and is supported as a measuring stick by much of society. The economist, on the other hand, is not bound by a client and therefore is less constrained by the environment. Economists may recognize all gains in their models, realized and unrealized, expected and unexpected. Accountants generally exclude recognition of unrealized gains on the grounds that they are not objectively determined and, thus, are not supported within the accountant's political and social environment. Accounting practices owe more to their immediate environment than detached philosophic reasoning (Bornemann, 1943, pp. 321–3).

The adoption of an 'orientation postulate' would assist in providing solutions for income reporting issues. The 'orientation postulates' represent a basis upon which bookkeeping transactions may be rationalized. However, as Newlove and Garner (1951, pp. 20–3) contended, accountants either consciously or unconsciously select an 'orientation postulate' when addressing financial reporting issues. Two different 'orientation postulates' do not, however, offer a common meeting ground (Newlove and Garner, 1951). Therefore, if accountants are not persistent in holding to one or the other, their conclusions as to matters of interest are likely to be inconsistent and unreconcilable.

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ABACUS, Vol. 25, No. 2, 1989

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Inconsistency in U.S. Accounting Standards: The Treatment of Interest

Consistency is an essential part of financial reporting: it applies both to the continuous use of the same accounting principles by an entity from period to period, and to consistency between various accounting principles used by the same entity. In the development of accounting standards, risks to users of inconsistencies can be reduced by good disclosure requirements, particularly so between various pronouncements. A study examining the treatment of interest found inconsistencies in two-thirds of the relevant U.S. GAAP pronouncements.

Key words: Accounting statements; FASB statements; GAAP.

Consistency is an essential part of financial reporting. For instance, a standard section of the auditor's report in the United States is that the financial statements have been prepared: 'in conformity with generally accepted accounting principles *consistently* applied' (italics added).

Usually, consistency is considered on the basis of a single accounting entity over time. It is regarded as the continuous use of the same accounting principles by that entity from one fiscal period to the next. The aim is to enable users of financial statements to compare the performance of the entity over a number of successive periods. This type of consistency provides financial statement comparability for a single entity over periods of time.

But what about consistency between the various accounting principles used by the same entity? For example, under SFAS 87 (1985) of the Financial Accounting Standards Board (FASB), a pension liability is reported at discounted net present value. But a liability from a troubled debt restructuring cannot be shown at net present value: under SFAS 15 (1977), it must be valued at the total of future payments due, without taking into account the time value of money by means of discounting.

Another example: under SFAS 52 (1981), unrealized gains or losses on foreign currency translation may be taken straight to equity, without passing through the income statement. But unrealized gains or losses on futures contracts (excluding foreign currency) must pass through the income statement.

Where is the consistency between the various U.S. accounting pronouncements? All U.S. Generally Accepted Accounting Principles (GAAP) pronouncements can affect a

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single reporting entity. Indeed, the inconsistency examples cited above could all exist within the same set of financial statements: pension liability, troubled debt restructuring, foreign currency translation and futures contracts. There could be utter inconsistency between the various sections of that single set of financial statements.

Thus, the same financial statements can contain a confusing combination of inconsistent accounting methods. Certain gains/losses will pass through the income statement, while others will go direct to equity. Some assets will be stated at cost, others at the lower of cost or market, and yet others at discounted net present value. Certain noncurrent liabilities will be shown at net present value, while others will not be discounted to net present value. The resulting financial statements lack coherence, may confuse users and do little to enhance the image of the accounting profession.

This is a time when the entire accounting profession in the United States is under severe scrutiny in the Congress, the courts and other influential centres of opinion.[1] The basic issue is the credibility of financial reporting. That credibility could be undermined by inconsistency between the various sections within the same set of financial statements.

Credibility suffers when accounting standards, taken together, are undisciplined, *ad hoc* and collectively illogical. Mutually inconsistent accounting methods within the same set of financial statements can frustrate user interpretation and analysis of the statements. This is one reason why the FASB embarked on its Conceptual Framework project.

The FASB has recognized this reason in its Concepts Statement No. 2 (1980), which notes in paragraph 20 that:

> this Statement concentrates on guidelines for making accounting choices, either by the Board or those who provide financial information . . . this Statement [is] intended to facilitate making those choices and . . . making them *consistent with one another.* (italics added)

The Conceptual Framework recognizes that it is important for accounting principles to be mutually consistent. But there has not yet been much practical progress on moving towards more consistency between accounting pronouncements. In our view substantial progress could be made by a thorough review of inconsistencies between different pronouncements.

PURPOSE AND APPROACH

In the development of accounting standards, inconsistencies between standards are always a hazard. The risks to users of financial statements based on inconsistent GAAP can be reduced by good disclosure requirements. High standards of disclosure can enable users of financial statements to adjust reported information in order to overcome inconsistencies in presentation. In developing disclosure requirements it is probably important to bear in mind the danger of possible inconsistencies between pronouncements. For this reason, the present study pays special attention to required disclosures and their ability to mitigate inconsistencies between various pronouncements.

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[1] For evidence of this scrutiny in the 1980s, see Chatov (1985) and Kaplan (1987). Similar criticism in the 1970s is contained in the Moss (1976) and Metcalf (1977) congressional reports.

As a beginning, we have selected one important topic that cuts across as many pronouncements as possible. The selected topic is the accounting treatment for interest.[2] Interest is clearly a vital part of many pronouncements. It is involved in accounting for leases, pensions, discounts and premiums on bonds payable, and interest capitalization—just to name a few key areas of accounting.

DESCRIPTION OF THE STUDY

The study consists of the following steps:

1. A search through promulgated U.S. GAAP to identify the pronouncements that explicitly include a treatment of interest;
2. A check for consistency between pronouncements, with respect to the treatment of interest;
3. An analysis of specific inconsistencies found; and
4. Conclusions and recommendations.

Each step is more fully dealt with below.

Identify Pronouncements with Treatment of Interest

Promulgated U.S. GAAP include not only FASB standards, but also the pronouncements of predecessor authoritative bodies such as the Accounting Principles Board (APB), to the extent that these prior pronouncements have not been modified or repealed by the FASB. All of promulgated GAAP are equally authoritative, regardless of whether the original source was the APB or the FASB. Therefore our study includes both APB and FASB pronouncements.

There are several aspects of accounting for interest to be considered. For this study to be as comprehensive as possible, the treatment of interest is viewed in terms of several important facets:

1. Is simple or compound interest prescribed?
2. Is the prescribed interest rate current or historic in nature?
3. Does the prescribed accounting require a discounted net present value basis of valuation for the particular asset or liability involved?
4. Is the prescribed interest rate limited to debt funds, or are the costs of nondebt funds also considered?
5. Is there required disclosure of the interest rate used?

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[2] This paper excludes any discussion on the basic question. In view of the diversity of rules, there are no guiding principles by which the propriety of including interest may be determined.

TABLE 1

U.S. GAAP PRONOUNCEMENTS RELATING TO INTEREST

Standard	Subject
APB 12	*Amortization of Long-Term Debt Discount/Premium* (December 1967)
APB 21	*Interest on Receivables and Payables* (August 1971)
APB 26	*Early Extinguishment of Debt* (October 1972)
SFAS 12	*Marketable Securities* (December 1975)
SFAS 13	*Lease Capitalization* (November 1976)
SFAS 15	*Troubled Debt Restructuring* (September 1977)
SFAS 34	*Capitalization of Interest* (October 1979)
SFAS 47	*Disclosure of Long-Term Obligations* (March 1981)
SFAS 49	*Product Financing Arrangements* (June 1981)
SFAS 55	*Convertible Debt as a Common Stock Equivalent* (February 1982)
SFAS 60	*Reporting by Insurance Enterprises* (June 1982)
SFAS 69	*Oil and Gas Producing Companies* (November 1982)
SFAS 74	*Special Termination Benefits Paid* (August 1983)
SFAS 81	*Post Retirement Health and Insurance Benefits* (November 1984)
SFAS 87	*Pension Accounting* (December 1985)
SFAS 88	*Pension Accounting* (December 1985)

Table 1 sets out the U.S. GAAP pronouncements where interest treatments have been identified. As Table 1 shows, sixteen GAAP pronouncements have been identified that deal explicitly with the treatment of interest.

Report Inconsistencies in Interest Treatment

The pronouncements that reveal inconsistencies within GAAP for the treatment of interest are listed in Table 2, which gives eleven pronouncements with inconsistencies in regard to interest treatment. These accounting standards, out of the sixteen pronouncements in Table 1, represent 69%, or about two-thirds of all the pronouncements identified. It seems, therefore, that inconsistency of interest treatment in GAAP is significant, both in nature and extent.

Analyse the Specific Inconsistencies Found

APB 26 (1972) deals with the early extinguishment of debt, and it requires full recognition of gain or loss in the period of extinguishment. Debt is not 'marked to market' prior to its extinguishment, so the entire gain or loss falls into one period.

In contrast, SFAS 12 (1975) requires marketable equity securities to be reported at the lower of cost or market, on an overall basis. On the surface this is an inconsistent treatment for an asset, compared with the liability treatment in APB 26. However, both treatments are consistent with the principle of conservatism. GAAP recognizes possible losses in SFAS 12, but does not recognize possible gains in APB 26.

This raises the issue of which principle should receive first priority: consistency or conservatism? If it is the latter, then both pronouncements are consistent with conservatism.

A similar issue surfaces in relation to SFAS 15 on troubled debt restructuring. Restructured debt is not to be reduced below the sum of future payments without regard to discounted net present value. This appears to lack consistency with SFAS 12

TABLE 2

INCONSISTENT TREATMENTS OF INTEREST IN U.S. GAAP

Standard	Subject	Simple/ compound interest	Current/ historic rate?	Basis for rate: NPV or other	Debt funds only?	Disclose interest rate?	Problems of consistency
APB 26	Extinguishment of debt (early)	Neither	N/A	N/A	Yes	No	Yes: SFAS 12
SFAS 12	Marketable securities	Compound	C	Market	No	N/A	Yes: APB 26
SFAS 15	Troubled debt restructuring	Neither	N/A	N/A	N/A	N/A	Yes: APB 26 NPV ignored
SFAS 34	Interest capitalization	Unclear	H	Other	Yes	No	Lack of clarity and rate disclosure
SFAS 47	Disclosure of long-term obligations	Compound	H	NPV encouraged	Yes	No	Yes: 'encouragement' inconsistent with required disclosure
SFAS 49	Product financing arrangements	Unclear	H	Actual	Yes	No	Standard is vague
SFAS 55	Convertible debt as common stock equivalent	Compound (SFAS 85)	H	NPV	Yes	No	Rate at issuance: never updated
SFAS 60	Reporting by insurance enterprises	Compound	Actuarial valuation	NPV	No	No	Rate disclosure only 'encouraged'
SFAS 69	Oil and gas producing companies	Compound	N/A	10% Fixed	N/A	Yes	Fixed 10% inconsistent with any other standard
SFAS 74	Special termination benefits paid	Compound	Actuarial valuation	NPV	N/A	No	Disclosure undefined
SFAS 81	Post retirement health and insurance	Neither	N/A	N/A	N/A	N/A	Inconsistent; but interim standard only

N/A = not applicable.

on marketable securities, where the required reduction to market value amounts to an implicit recognition of the estimated net present value of future cash flows (which market value presumably is reflecting).

In the case of SFAS 15, however, would not conservatism allow the use of net present value? Most long-term liabilities are in fact reported at net present value in accordance with GAAP. It therefore seems that SFAS 15 is inconsistent, even in the light of conservatism.

Next is SFAS 34 (1979) on interest capitalization. No direct issue of inconsistency arises. But there is a lack of clarity regarding compounding of capitalized interest. Is interest to be charged on the balance of construction work in process that already includes previously capitalized interest from prior periods? Or is interest to be capitalized only on the part of construction work in process not including previously capitalized interest? Further, SFAS 34 does not require any disclosure of the rate of interest involved. The effect of not disclosing the rate is to restrict comparisons between firms which may be capitalizing interest at very different rates.

These absences of clarity invite variety in interpreting the standard, and thus open the door to inconsistencies in the application of SFAS 34. These inconsistencies may exist not only between reporting entities, but also intra-entity. For instance, in consolidated statements, the various entities in the consolidation may use different practices with respect to SFAS 34. The resulting consolidation then embodies these inconsistent practices.

Also, the question of compounding in SFAS 34 may be treated in a way that is consistent with SFAS 15 (do not compound) or with SFAS 55 (compounding is required by virtue of using the discounted cash flow procedure). In sum, lack of clarity can easily lead to inconsistency.

SFAS 47 (1981) and 49 (1981) deal respectively with disclosure of long-term obligations and product financing arrangements. Both these standards increase the narrative disclosure requirement for 'off balance sheet' type items. Therefore, should they be viewed as being outside of the pure accounting treatments of interest? Then consistency would be less of an issue.

On the other hand, however, SFAS 47 on long-term obligations 'encourages' (but does not require) use and disclosure of net present values. This raises a serious question. Are net present values considered to be helpful in evaluating the future impact of long-term obligations? If not, then encouragement for stating net present value (without requiring or even encouraging disclosure of the discount rate used) would be unproductive.

But if net present values are considered helpful, why are they not required (rather than encouraged) to be disclosed? That would be more consistent with the disclosure requirements that GAAP makes mandatory as opposed to optional under most standards? Mere 'encouragement' by the FASB seems illogical. Disclosure beyond the mandated minimum is *always* an option, and therefore 'encouragement' adds nothing of substance to financial reporting. It smacks of political compromise in the standard-setting process, and does nothing to improve the consistency of financial disclosure.

SFAS 49 on product financing arrangements is generally vague as to whether interest should be simple or compound, and it does not require that the interest rate be disclosed, thus restricting comparability. This standard seems to be lacking in clarity, and it may therefore lead to inconsistency.

SFAS 55 (1982), on determining whether convertible debt is a common stock equivalent, seems to lack *internal* consistency. This *intrastandard* type of inconsistency is different from the *interstandard* type of inconsistency which is our main focus. Nevertheless, it is still an inconsistency that we believe the FASB should correct in the interests of achieving greater consistency in accounting standards.

The test that SFAS 55 uses is based on corporate bond yields to maturity. These yields necessarily will fluctuate from time to time. Yet the test is performed only once, at the time of issuance of the convertible debt, and the result then determines for all future periods whether or not the convertible debt is a common stock equivalent. It seems inconsistent to make a one-time test in a necessarily fluctuating interest rate environment. This inconsistency within SFAS 55 fails to recognize that the likelihood of the conversion taking place is dependent, *inter alia*, on the current rather than the historic interest rate.

SFAS 60 (1982; *Reporting by Insurance Enterprises*) and SFAS 74 (1983; *Special Termination Benefits Paid*) are similar in that both employ actuarial valuations. This automatically brings in compound interest and net present value. The inconsistency with other promulgated GAAP is that disclosure of interest rates is not required under either standard (but 'encouraged' in SFAS 60). Again, encouraging rather than requiring disclosure of rates of interest invites inconsistency and can also reduce the comparability of financial statements.

SFAS 69 (1982) deals with reporting on mineral reserves by oil and gas producing companies. It sets a fixed rate of discount (10%) for discounting future revenues to net present value in the required supplementary statements. This rate is perhaps helpful for comparability between companies, although it is important to bear in mind the tentative nature of oil and gas reserve estimates. But there is no consistency with other GAAP in regard to mandating a fixed rate of discount.

Finally, SFAS 81 (1984) deals with employee post-retirement health and insurance benefits. This standard does not require the use of interest at all. Hence it is inconsistent with other GAAP, which do provide for liabilities to be stated at net present value. However, SFAS 81 is of an interim nature, and the question of interest and net present value may be dealt with in the future.

CONCLUSIONS AND RECOMMENDATIONS

The study has found numerous inconsistencies in the accounting treatment of interest. These are as follows:

1. The main type of inconsistency is that which exists *between* different standards. An example is SFAS 12 (*Marketable Securities*) and APB 26 (*Early Extinguishment of Debt*). This kind of inconsistency reflects the collectively *ad hoc*, undisciplined and illogical nature of U.S. GAAP when viewed as a whole in relation to the issue of the treatment of interest.
2. Some inconsistencies between pronouncements may be reconcilable, but only by resorting to the principle of *conservatism* in accounting. An example is APB 26 on early extinguishment of debt and SFAS 12 on marketable securities. But this reconciliation requires giving a higher priority to the principle of conservatism than to the principle of consistency between pronouncements. The result is a paradox: to arrive at consistency, we put consistency in second place to conservatism! This is clearly unsatisfactory.
3. There is also inconsistency *within* single pronouncements. An example is SFAS 55 (*Convertible Debt as a Common Stock Equivalent*), which rigidly holds the interest rate to its level at original date of issuance, and ignores all the inevitable subsequent interest rate fluctuations. This accounting standard is correct only in the same manner as a stopped clock, which shows the right time merely by coincidence.
4. Finally, pronouncements involving the treatment of interest have been found that detract from consistency either due to *vagueness* (such as SFAS 34 on interest capitalization) or to the FASB's practice of '*encouraging*' but not requiring the making of certain disclosures e.g., SFAS 60 on reporting by insurance enterprises).

These inconsistencies, taken together, are significant. About two-thirds of the U.S. GAAP pronouncements that involve interest treatments are mutually inconsistent. The pervasive nature of these inconsistencies clearly indicates that it is most important to check the consistency between the various standards of U.S. GAAP, and also within each standard.

This direction for research is practical and productive. As the present study shows, there is plenty of work to be done in making GAAP more consistent within and between standards, with respect to the treatment of interest. The study points out specifically the particular inconsistencies that require attention, and directly indicates the action needed to remove each of these inconsistencies. The study also suggests that consistency in all pronouncements, including the treatment of interest, should:

1. Require compound rather than simple interest, and the use of net present value techniques;
2. Require disclosure of the interest rate used;
3. Require a current interest rate, rather than the use of a single past period rate; and
4. Require rather than 'encourage' disclosures, and add clarity to pronouncements that suffer from vagueness.

FURTHER QUESTIONS

The accounting treatment of interest has been shown to be important and pervasive in U.S. GAAP. But there are probably further pervasive issues across the entire body of U.S. GAAP that could be researched in similar manner. It would be useful to focus on these other important issues in order to test the consistency of U.S. GAAP across pronouncements in these areas too. Finding such issues, testing them and then recommending ways to eliminate inconsistencies seems to be a productive direction for improving the consistency of U.S. GAAP.

Some pervasive issues that seem well worth exploring are:

1. Unrealized gains losses—such as those relating to Marketable Securities, Foreign Currency Translation and Futures Contracts, in relation to deduction from net income, versus direct charge off to retained earnings.
2. Executory contracts—why are they generally excluded from financial statements, except for capital leases?
3. Timing of measurement—for example, year-end versus the transaction date with respect to capitalization of leases, the measurement of compensation for employee stock ownership plan (ESOP) purposes, and the definition of common stock equivalents with respect to calculation of earnings per share.

Also to be considered are the accounting principles of other countries, and whether any of these reflect a higher level of consistency than U.S. GAAP. Last but not least, the present type of study has a clear ultimate benefit. Improvement in the consistency between pronouncements stands a good chance of improving the overall credibility of financial statements. Improved credibility will tend to benefit financial statement issuers and users alike. It will raise the general quality of financial reporting, thereby enhancing the operation of capital markets and contributing to the reputation of the accounting profession as a whole. These are certainly objectives worth pursuing.

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ABACUS, Vol. 25, No. 2, 1989

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Manuscript Additions to the Edinburgh University Copy of Luca Pacioli's *Summa de Arithmetica*

The copy of Luca Pacioli's *Summa* (1494) now owned by the University of Edinburgh, Scotland, exhibits at the end fifty-nine pages of manuscript additions, dating from the late fifteenth and early sixteenth centuries. There is evidence that this material was written in the main by Filippo Calandri, who published the first printed textbook of arithmetic in Florence in 1491/2. The author has deciphered most of the MS from photocopies.

The material has no reference to bookkeeping or accounting, but is a curious and interesting product of the Renaissance Italian mind. Much of it appears to be notes for a book on mensuration, probably by Calandri, and incorporating some matter from his *Arithmetica*. The MS also includes many astrological calculations, and a series of Latin aphorisms with a prologue, besides (in another hand) a few magic charms or spells.

The MS material is described and analysed, and the relation of its parts to one another, to Calandri and to Pacioli, is explored.

Key words: Accounting; History; Italy.

This article is inspired by Anna B. G. Dunlop's paper at the Fourth International Congress of Accounting Historians, Pisa, 1984, and subsequently published in *Abacus*, 1985.

Dunlop describes in detail five copies of the first edition of Luca Pacioli's *Summa de Arithmetica* (1494) held in Scottish libraries. The one relevant to this inquiry is in Edinburgh University Library, and was donated by Philip Kelland, Professor of Mathematics 1838–79. On the first page (general table of contents) the entry for *Distinctio IX*, *Tractatus XI* (on double entry bookkeeping), ending 'del quaderno in vinegia' (of the ledger in Venice), has a manuscript addition: '& fuorj' (and elsewhere). Thus, an early owner knew that double entry was in use in other parts of Italy in 1494. Dunlop further notes the presence of fifty-nine pages of manuscript additions—the first on the blank verso of the last printed leaf (*Geometria*, folio 76), the others on

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The paper was presented at the Fifth World Congress of Accounting Historians, Sydney, August 1988. The author is indebted to Edinburgh University Library, Cambridge University Library, and to the British Library, London, for access to relevant materials; and to Miss Anna B. G. Dunlop, of Edinburgh, for the original inspiration for these studies, and for much help and encouragement.

twenty-nine sheets of paper glued into the back of the book. These sheets all bear a watermark in the form of a bull's head from which arises a tall cross, around which a snake is wreathed. This mark differs from those of the printed pages, which bear either a duck or a pair of scales as watermarks. In various parts of the MS are dates ranging from 1497/8 to 1503/4. There are also two sets of astronomical tables covering the years 1507–17, with blank lines going up to 1520.

The MS is for the most part written, some in Italian and some in Latin, in what Dunlop describes as 'a fast, cursive, pre-italic script', similar to that of the addition on the contents page, and in 'a small, assured handwriting'. There are two pages in a different, larger hand, in Italian, and two blank sides. The other pages are covered with elaborate calculations in minute Arabic figures (with Latin notes), or with astrological and other diagrams. Many of the written pages also bear small geometrical diagrams illustrating the text.

The author, working from a complete set of photocopies supplied by Edinburgh University, transcribed the script, except for some places where the ink has faded too much and some individual words which have baffled his efforts to decipher them. The handwriting, though strange to a modern eye, is fairly consistent in the shaping of letters, but contains many contractions. Those that occur frequently can be interpreted from the context. Isolated ones can sometimes be guessed at, sometimes not. The Italian of the main text appears to be of Tuscan provenance, but with some Venetian forms, such as *z* for *g*, and *x* (pronounced 'sh') for *c* before *e* or *i* (pronounced 'ch'). These peculiarities are found also in Pacioli's own text; he was a Tuscan but his printer was Venetian. By contrast, the language of the two pages in larger writing is clearly Venetian; these pages may have been inserted by the main author, as curiosities. The Latin of the texts is classical in character, but with some eccentricities of spelling, such as 'scensus' for 'sensus' (sense), and arbitrary doublings of consonants.

The material in the 'Pacioli' MS may be classified under four heads:

1. Mathematical problems in Italian, with diagrams (*Geometria*, fo. 76 verso, and MS pages 1 recto to 10 verso);
2. Astrological calculations, diagrams and tables (MS pages 11 recto to 14 recto, and 22 recto to 29 verso, the last page);
3. A Latin prologue and 168 aphorisms, out of 200 planned (MS pages 14 verso to 19 recto), followed by two blank pages (19 verso and 20 recto), intended for the remaining thirty-two aphorisms; and
4. Three magical charms or spells of a mundane and harmless character, with diagrams and 'doodles', in a different hand from the rest and in Venetian Italian (MS pages 20 verso to 21 verso).

Mathematical Problems (21 pages), and their Relation to Filippo Calandri's Arithmetica *(1491/2)*

The first page, on the blank verso of the last leaf of the book (*Geometria*, fo. 76), is headed by Euclidean diagrams relative to a proof of Pythagoras' theorem. The text is confined to elementary definitions (point, line, angle, circle, etc.). There is no discussion of Pythagoras' theorem at any stage, but it is clear that the author of the MS was familiar with it.

The first twenty pages (1 recto to 10 verso) of the MS proper are devoted to numerous mensuration problems, mainly of the circle and of plane figures enclosed in it or enclosing it. The date: '1497 nel 22 marzo' (22 March 1497/8—24 March being the year-end by the Julian calendar) appears at the top of page 1 recto. Crosses appear at the top of sundry other pages. At the top of 3 verso is written: 'phillippi callandri'.

Filippo Calandri was the author of *Arithmetica* (as it is commonly called), the first book of its kind to be printed—in Florence in 1491/2. The author has examined a copy in good condition with a nineteenth-century vellum binding, owned by the Library of Cambridge University, England. It is a small octavo of 104 leaves; they have no printed numbers, but have been numbered in ink by a former owner. There is no title-page, but the frontispiece is headed in Latin: 'Pictagoras [*sic*] arithmetrice introductor' (Pythagoras, introducer of arithmetic). The nineteenth-century binder has written these words on the spine as a title. The woodcut shows Pythagoras teaching arithmetic to two boys: all three persons are dressed as fifteenth-century Florentines. Opposite is a Latin dedication: 'Philippi Calandri ad nobilem et studiosum Julianum Laurentii Medicem de arimethrice [*sic*] opusculum' (Filippo Calandri's little work on arithmetic [is dedicated] to the noble and studious Giuliano de' Medici, son of Lorenzo). Giuliano de' Medici (1479–1516), then twelve years old, was the third son of Lorenzo il Magnifico (1449–92), the effective ruler of Florence. In 1512–13 Giuliano was himself ruler after his family's return from exile, and in 1515 was created Duke of Nemours by François I of France.[1]

The dedication of *Arithmetica* is followed by a preface, in Italian like the text. In it Calandri speaks of adapting his work 'secondo lo stilo fiorentino' (in accordance with the Florentine style), and complains of his difficulties in getting it printed in Florence. Thus it may be inferred that Calandri was not a Florentine, and had to change his style. At the very end (fo. 104 verso) it is stated that the book was printed in Florence by Lorenzo de Morgiani and Giovanni Thedesco da Maganza, and finished on 1 January 1491/2. (The second printer, 'the German from Mainz', was Johann Petri.) A second edition was printed, also in Florence, by Bernardo Zucchetta on 20 July 1518; it was substantially the same as the first, and used the same woodblock illustrations.

Calandri's *Arithmetica* deals in order with the four rules of arithmetic, including fractions. It has a woodcut of the old hand signs by which any number up to 9,999 could be represented—a feature also of Pacioli's *Summa*. Multiplication tables, and tables of squares, occupy many pages; they have borders of *grotteschi*, a type of Renaissance decoration derived from wall paintings in the vaults (*grotte*) of Nero's palace in Rome. Calandri continues with numerous problems, two to a page. The more elaborate ones are illustrated with little woodcuts at the foot of the page. The problems range over many topics, some of a commercial nature and involving money calculations—prices of goods by weight or measure, interest on loans, and foreign exchange, as well as bartering transactions, and partnerships or joint ventures.

Comparison of the later pages of *Arithmetica* (fos 93 recto to 99 verso) with pages 3 verso to 5 recto of the 'Pacioli' MS (headed by Calandri's name) shows this part of the MS to be substantially a copy from the book, with some omissions. Among the problems common to both texts is the following (*Arithmetica*, fo. 98 recto; MS page 5 recto):

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[1] Guiliano's tomb stands in the New Sacristy of San Lorenzo; it was sculpted by Michelangelo and today constitutes its subjects main claim to fame.

> A tree stands upon the bank of a river; it is 50 cubits high, and the river is 30 wide. This tree happens to break, in such manner that the top of the tree touches the exact middle of the river bank. Required: how many cubits are broken off, and how many cubits remain upright?

The answer given is correct: '16 cubits remain upright, and 34 cubits are broken off'. The true working depends on Pythagoras' theorem plus simple algebra. Calandri offers an arithmetical solution which is unintelligible; did he solve the problem by trial and error? In the book there is a little picture of the broken tree extending across the river.

The 'plagiarised' problems are preceded (pages 1 recto to 3 recto), and followed (pages 5 verso to 10 verso), by extensive material of similar character. The most plausible explanation is that this represents notes by Filippo Calandri (or an imitator) for a second book on mensuration, never completed. On this supposition, the matter lifted from his 1492 book consists of problems that he (or another) had decided to salvage (or plagiarise) and incorporate in the new work.

The proposed treatise begins (page 1 recto) by invoking the blessing of Saint Geminianus and the Grace of God. Saint Geminianus' feast-day is 16 September; was this Calandri's birthday, or another writer's name-day? The MS proceeds: 'I desire at the end of this volume to note some rules for my delight, the which rules, both in geometry and in arithmetic, will be correctly judged'. There follows an explanation of the properties of the circle, illustrated by several circles truly drawn with compasses. The value $3^1/_7$, or $\frac{22}{7}$, is introduced as the ratio of circumference to diameter, but the term π is nowhere used. The student is invited to find the area of a circle by squaring the circumference and dividing the result by $\frac{88}{7}$ (i.e., 4π), instead of using the simpler formula: $A = \pi r^2$. Throughout the treatise calculations are made relative to the diameter, not the radius. Decimal fractions and logarithms were both unknown until the seventeenth century and Calandri's computations had to be performed in vulgar fractions, sometimes with awkward denominators. This was particularly true of square roots. The author gives his result each time, without explaining his method of extracting irrational roots. He probably worked by successive approximations, and his answers are not always quite accurate, even by his standards.

Pages 1 verso to 3 recto are devoted to problems in mensuration of the circle and of plane figures inscribed in or exscribed round it. The solutions (generally correct) are given with the workings, but the principles are not explained, even when not very obvious. Thus, one problem (page 3 recto) requires a circular mound of chalk or clay (presumably of uniform height) to be divided between three workmen who are to dig it away (each in turn working inwards round the circumference), in such manner that they will all do equal amounts of work. In other words, the circle is to be divided into three concentric segments of equal area—a central circle and two rings. Since the area of a circle is proportionate to the square of the diameter, Calandri requires the diameter to be squared, two-thirds of the square taken, and its square root found. The answer is deducted from the diameter of the mound and the remainder halved, to give the width of the outer ring to be dug away by the first workman. In like manner the width of the second man's ring is found, and the third is left with the central circle. The principle is correct, but the root extraction is slightly inaccurate, so that the answer is not quite correct. The diameter of the mound being 7 cubits, the author has to find the square root of 16⅓ (one-third of $7^2 = 49$); he takes it as 4, when the correct answer (to four decimal places) is 4.0415.

Pages 5 verso to 10 verso include many problems in mensuration of solids, as well as solutions to triangles—often by 'trick' methods whose rational basis (in Pythagoras' theorem) is not explained. Occasionally a problem breaks off unsolved; an attempt to find the diameter of a ball of wool, made by unwinding three smaller ones of different sizes and rewinding all the wool, ends unresolved. The author perhaps realized that he would need to find cube roots, whose extraction without decimals or logarithms would be difficult, tedious and possibly beyond his skill (though Pacioli gives a method of doing it).

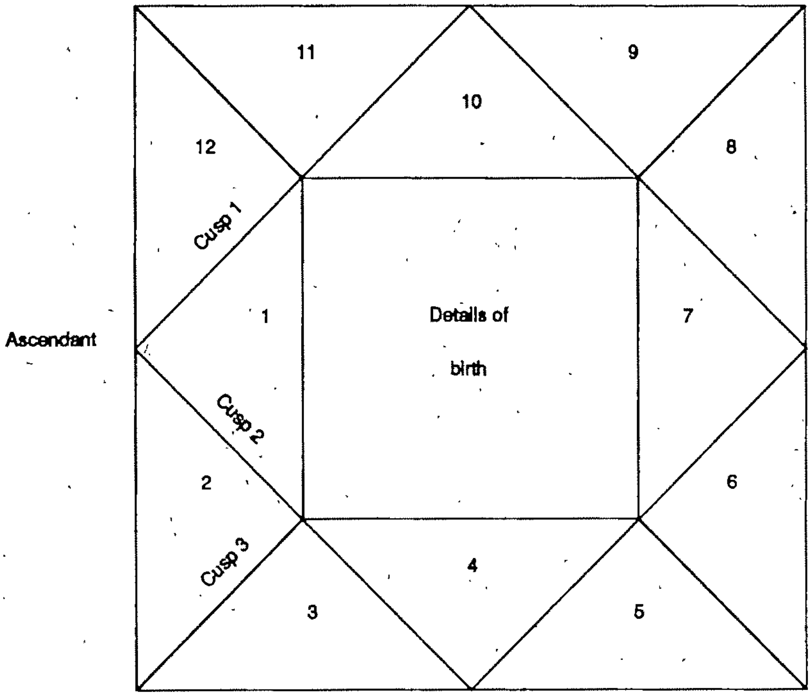
If Filippo Calandri was indeed the author of the MS, it would be natural for him to buy the *Summa*, a more advanced treatise than his own *Arithmetica*. His plan was evidently to produce a cheap, popular book on mensuration, similar to *Arithmetica*, but for some reason (possibly death) he never finished it.

Astrological Calculations, Diagrams and Tables (23 pages)

Calandri's mathematical expositions are followed by two blocks of astrological calculations, separated by other matter described later. The first block extends to seven pages, from 11 recto to 14 recto. Page 11 recto exhibits an unfinished diagram of the Zodiac, drawn with compasses, in which only one sign (Cancer) has been named. The next two pages (11 verso and 12 recto) are covered with abstruse calculations in Arabic figures, ranged in columns, with occasional notes in Latin, and symbols for the planets of the Ptolemaic (terricentric) system of astronomy, including the Sun and Moon.

The purpose of these computations is explained on page 12 verso. It contains three diagrams, each in the form of a small square surrounded by a larger one, the intervening space being divided into twelve triangles. These drawings are 'figures of the heavens', as used by an astrologer in casting a horoscope, or 'nativity', for a birth occurring at a particular place and time. The whole (imaginary) sphere of the sky is arbitrarily divided, by means of arcs drawn through the north and south points of the horizon, into twelve equal segments like those of an orange. These are the twelve celestial 'houses', six above the horizon and six below. They are numbered in order, starting with the house just below the eastern horizon (the 'ascendant'), going through the nadir to the western horizon, then coming up over the zenith and down the eastern sky to the horizon again, the twelfth house being just above it. Elaborate calculations are necessary to relate the houses to the signs of the Zodiac, and to find the positions of the planets within the houses. The workings on pages 11 verso and 12 recto of the MS are evidently of this nature.

FIGURE 1



The Renaissance astrologer used a 'figure' with twelve triangles as described (see Figure 1). He drew his outer square, then joined the centres of the four sides to make a second square, set diagonally to the first one. He repeated the process to form the innermost square, finally joining its corners to those of the outer square. The triangle in the centre of the left side of the figure was the ascendant or first house (the most important single one in the astrologer's eyes), and the other houses were read anti-clockwise round the central square. The leading edge of each triangle represented the beginning or 'cusp' of the house, that is, the point at which its boundary intersected the ecliptic (the apparent annual path of the Sun through the middle of the Zodiac). The cusp was denoted as the sign in which it fell (Aries, Taurus, etc.), and the number of degrees and minutes from the beginning of that sign (an arc of 30° on the ecliptic). Within each house were noted the 'glyphs', or symbols, for the planets included therein with notes of their positions in the Zodiac. From all these data the astrologer was supposed to draw inferences about the course of the subject's life and the features of his character! In the inner square were noted his or her name, the place, date and time of birth, and other information. (Modern astrologers use a circular diagram divided into twelve wedge-shaped segments.)

The three nativity figures on page 12 verso of the 'Pacioli' MS are seen, from the Latin notes in their inner squares, to be calculated respectively from 10 January 1503/4 at 6.36 p.m.; 12 January 1503/4 at 1.30 p.m.; and 27 January 1503/4, at a time too difficult to read. No place of birth is stated (possibly the author's home), nor are the subjects named. Possibly Filippo Calandri was an astrologer as well as a mathematician, or liked to prove to himself that he understood the calculations used in casting horoscopes.

Page 13 recto consists merely of attempts to draw complex patterns by means of a grid of squares. Pages 13 verso and 14 recto contain two astronomical tables, perhaps copied from an ephemeris (a book of such tables). They show respectively the 'conjunctions' and 'oppositions' of planets (comings together, and separations on opposite sides of the sky), month by month, for the years 1507–17, with blank lines to be filled in for 1518–20. Matter of a different nature (described below) fills the next pages up to 21 verso. The last sixteen pages of the MS (22 recto to 29 verso) contain masses of astrological calculations, and occasional nativity diagrams, relating to dates early in the sixteenth century, with some cryptic notes in Latin.

Latin Prologue and Aphorisms (12 pages)

Pages 14 verso to 19 recto are closely written over in Latin, in the same handwriting as the Italian mathematical problems tentatively ascribed above to Filippo Calandri. They contain a prologue (about three-fourths of page 14 verso), followed by 168 aphorisms, or 'wise sayings'. The prologue indicates that 200 were planned, and two blank pages (10 verso and 20 recto) have been left to allow for completion of the set. The author seems to have been counting carefully, for in the left-hand margin the Arabic figures '100' and '120' appear at the proper intervals.

The Latin is of a literary character, classical on the whole, with some eccentricities of spelling as noted earlier. The prologue is of an allegorical cast, but appears to give some autobiographical information. The first part may be translated thus:

> Having been expelled from my country, stripped of my property, and punished for the good that I had done, I was living in exile in Piacenza. For recreation I used to go out along the pleasant ramparts of the city. Entering the open doors of a lovely palace of wondrous extent, built of marble blocks artistically disposed, I was astonished by a pleasure garden, whose bank completely enclosed the bowers of a rose garden, and was itself most gloriously set with variegated purple flowers. In the midst of the garden stood a most lofty apple tree, whose top seemed to touch the very sky. Its branches with their twigs and leaves flung their shade over the whole extent of the garden, while from the boughs of this tree row upon row of apples hung down and offered themselves to whomever would take them. Allured, therefore, by these fruits with their various colours, I cautiously climbed the tree and plucked two hundred of the very ripest apples.

What follows is less easy to understand. It is clear that the author's apples stand for his moral aphorisms, to the intended number of 200. More obscurely, he goes on: 'the fourfold division of a verdant palm-tree' (presumably dividing into four branches at the crown) 'disposed me to think that everything in existence could be thus classified'.

With flowery rhetoric, he commends his 'opusculum quadriculum' (little work on fourfold themes) teaching of virtues and vices:

> The splendid orchard cajoles you with such efficacy, even when you do not wish to taste of it, that you must know of a truth that however many apples you may pluck from the basket, the more copiously will the basket overflow. Also, when this allowance is tasted it sharpens the senses and increases one's fluency, encourages virtue and justly drives out vice.

He continues:

> And so, reader, do you accept kindly this modest gift that a poor friend gives you. If you do not desire all at once to praise it entirely, do not find fault; and if you find something worthy of praise, you will contemplate why it is that to remember everything, and to sin deeply against no one while he is more possessed of virtue than of human frailty, is so marvellous in this world.

The next sentences contain several contracted words that the author is unable to decipher; consequently he has not been able to make much sense of a highly rhetorical passage. The prologue ends more intelligibly, if cryptically: 'Accordingly, you must know, I have desired to take a mighty and auspicious name. See, I have taken the name Claviger—the city which gave me birth,' etc., etc.

'Claviger' (key-bearer) is an ancient name for Janus, the Roman god of beginnings. Janus in turn suggests Janua, the Roman name for Genoa. Does this suggest Filippo Calandri (?) came from Genoa? If so, was it from that city that he went to Piacenza? That would be reasonable: the two places are only some seventy miles apart, across the Ligurian Apennines, and in the fifteenth century Picacenza was in the Duchy of Milan, whose frontiers marched with those of the Genoese Republic. As to the cause of the exile, we are in the dark. It has already been claimed that Calandri was probably not a Florentine, and he may as well have come from Genoa as from any other part of Italy.

The 168 aphorisms that follow the prologue are all, as promised, 'on fourfold themes'. All begin: 'Quatuor sunt quae . . .' (There are four things that . . .) or some variant of this formula. Thus, the first four sentences deal with the lessons taught by the four cardinal virtues:

> There are four things that prudence teaches us: to reflect upon things past, to set in order things present, to foresee things to come, and to suspend judgment in doubtful matters.
>
> There are four things in which fortitude instructs us: in prosperity not to be lifted up to pride, in adversity not to give way to despair, not to take revenge for a wrong, and to live an ordered life.
>
> There are four things of which temperance puts us in mind: to cut out superfluities, to restrain our desires, to abstain from unlawful acts, and to reject flattery.
>
> There are four things that justice teaches us: to love what is honourable, not to injure others, to put down pride, and to afford to each his rights.

Similarly, the next three aphorisms deal with the blessings that flow from observance of the three theological virtues—faith, hope and charity. Then come the four things each that induce prudence, temperance, *constancy*, and justice, summed up in one comprehensive maxim:

> There are four things that make a man perfect or bring him back to that state: to worship God, to love one's neighbour, to do to another what one would like to have done to oneself, and not to do to another what one would not like to have done to oneself.

Many subsequent aphorisms deal with the seven deadly sins—their effects, their causes, their remedies. Then are considered the qualities of different classes of men—kings, lawyers, litigants, secretaries, heads of households, soldiers, servants and the like. A large group of maxims begins in each case with the formula: 'There are four kinds of men who . . .' Examples include

> There are four kinds of men who are forgetful of benefits: a boy when he is grown up, a lowly man when he rises in the world, a proud man carried away with pride, and a prisoner let out of gaol.
>
> There are four kinds of men who rightly stand above others: kings above their subjects, parents above their children, husbands above their wives, and a master above his pupils.
>
> There are four kinds of men who exercise authority unjustly: the rich, the lustful, the proud, and the rash.
>
> There are four kinds of men displeasing to God and to the world: a poor man puffed up with pride, a rich man who upholds lies, an old man given to lechery, and a man who sows tares among brothers.

As the series proceeds, signs of strain begin to appear in the author. His examples become increasingly elaborate and recondite, and he resorts, at least once, to plagiarism: maxim no. 122 is lifted from the Book of Proverbs (30: 21–3):

> There are four things that make the earth shake: a slave when he becomes a king, a fool when he has been full fed, an odious woman when she is married, and a maidservant when she becomes her master's heiress.

The writer's determination to fulfil his promise of 200 aphorisms keeps him going for ten pages, and he does think of 168 groups of four things. Then he gives up, or is diverted to some other task, or dies, and his 'little work' remains unfinished and unpublished.

Magical Charms (three pages)

After such rarefied moral philosophy, a little light relief is welcome. Pages 20 verso to 21 verso of the 'Pacioli' MS provide this. Coming after the Latin aphorisms, the material is in different handwriting from the rest—in the same style, but larger and bolder. The language is Italian, with a distinctly Venetian flavour. The paper was presumably inserted by Calandri as a curiosity.

Page 20 verso is devoted to, of all things, a charm for exorcising bugs! The translation is as follows:

> This is how to make the knife to conjure away bugs. Take a knife made in the month of March, on a Wednesday, with a sheath half white and half black. Light a candle, and make a circle as shown below. Stick the knife in the middle of the circle and make a Solomon's seal as you see, saying three times: 'O bugs!'
>
> 'O bugs that are in this bed, in this shirt, and in this room: I command you that you come into this round or circle and depart from this room and from this shore, on pain of the displeasure of God and of the displeasure of our Lady Mother, Madonna Saint Mary; by the nativity of our Lord Jesus Christ, by his baptism, by his death, by his resurrection, and by his wonderful ascension: with the name of God, of the Virgin Mary, of Saint John the Baptist who baptised our Lord Jesus Christ, of [Saint Joseph] who baptised him and carried him in his arm, of the four Evangelists, of the twelve Apostles, and of the [blank]: with the pains and death that took place on Friday and at Easter.'

'Saint Joseph' is the translator's emendation of 'Jesus Christ', inadvertently repeated. In the place marked 'blank' there seem to have been crossed out the words: 'three Persons' (i.e., the Holy Trinity), apparently censored as irreverent in such a trivial context.

After the first paragraph there is a drawing of the magic circle specified in the charm, with some of the words written round it. In the middle is an upright knife and a pentacle, or Solomon's seal—a five pointed star drawn without lifting the pen from the paper. This was a sign much used in popular magic. The next page, 21 recto, shows merely various doodles, including several pentacles. Page 21 verso contains two further charms. The first is headed. 'To a man or woman whom you would make to fall in love' and proceeds:

> Buy a new mirror from whom you please, and take it apart, and write around it these characters. Then write on the glass your name and the name of the woman whom you desire, and place it under the earth of the threshold of her door, where she passes most often, and do this: light a candle and . . .

Here the charm breaks off. Beneath these words, in the original, is a rough freehand drawing of a circular mirror, with the glyphs of the twelve signs of the Zodiac written anticlockwise round it. Below the diagram are a few straggling words, of which only the first, 'black', is legible. There are flourishes at the bottom.

The last charm translates as follows:

> To know whether a woman will bear a male or female child. Find out the month when she became pregnant, count up to the month when [the child] is to be born, and count the words of these months [i.e., the number of letters in them]. Write the names of the father and mother, and count the words of the months of pregnancy and the syllables. If they come to an even number in both cases, the child will be female, and if they come to an odd number, it will be male. If one number comes out odd and the other even, add the two together and count them again. If they come to an even number the child will be female, and if to an odd one, it will be male.

The last procedure will always produce an odd number. In any case, such a piece of hocus-pocus might be expected to have approximately 50 per cent success over time, which is quite good for magic!

The MS at the back of the Edinburgh University copy of Pacioli's *Summa* (1494) displays a surprising variety of material, albeit without reference to bookkeeping or accounting. There is reason to ascribe most of it to Filippo Calandri, the author of the first printed textbook on arithmetic, published in Florence in 1491/2. This ascription can be neither proved nor disproved, since no authenticated handwriting of Calandri has come down to us for comparison with the MS. Whoever he was, the author seems to have been a man of many parts—mathematician, astrologer and moral philosopher or coiner of aphorisms. He appears to have originated from Genoa, and to have suffered banishment to Piacenza, where he was inspired to write his aphorisms. As a mathematician he was a natural purchaser of Pacioli's treatise, and evidently intended to produce a shorter, more popular book on mensuration, for which Calandri's *Arithmetica* was the starting-point, whether or not he wrote the MS.

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ABACUS, Vol. 25, No. 2, 1989

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The Estimation of Realizable Holding Gains

The present paper outlines rules for estimating realizable holding gains within a current cost framework. The foundation for the procedures lies with a theorem properly named for Edwards and Bell (1961). The theorem is stated and proved and then employed to derive the relevant quadrature rules. Estimates of the holding gains applicable to U.K. manufacturing industry are then made. The estimates are found to be highly sensitive to the quadrature rule used.

Key words: Depreciation; Inventory; Quadrature rules; Realizable cost savings.

It is now nearly thirty years since Edwards and Bell (1961) first suggested that periodic income should be dichotomized

> into two components: (1) *current operating income* (COI), the excess over a period of the current value of output sold over the current cost of related inputs . . . and (2) *realizable cost savings or holding gains* (RHG) which consist of any increases during the period in the values of assets and any decreases in the values of liabilities while these assets and liabilities are held by the firm. (Edwards, Bell and Johnson, 1979, p. 466)

The proposal has spawned a plethora of research into both the desirability (and feasibility) of segregating operating and holding gains and the accuracy or otherwise of techniques for estimating the required current cost adjustments.[1] To some extent, interest in this area of accounting research has waned in recent years. In Australia and overseas, however, many government business enterprises are now required to report on a current cost basis, with return on current cost equity being used as a basis for price setting and assessing efficiency (Byatt, 1986; Department of Finance, 1988). In Australia, for example, some seventeen Commonwealth government and semi-government instrumentalities are now required to prepare current cost financial statements (Department of Finance, 1988, p. 9).

The present note addresses the important implementation issue of estimating current cost realizable cost savings or holding gains, an area which has received virtually no attention before this. Yet given the increasing use being made of current cost financial statements, in the public sector at least, this is an area of vital practical

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[1] See Peirson and Tippett (1985) for details of the relevant literature.

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concern. This is especially so, since should the government ever move towards a tax system based on real returns (Swan, 1978), rules for eliminating the inflationary component of income will need to be worked out. The paper is divided into four sections. Part one outlines a general theorem for computing the realizable cost savings accruing on a general resource. Part two uses this result to derive quadrature formulae for estimating the realizable cost savings accruing on inventory and fixed assets. In part three, we use data for U.K. manufacturing industry to test the sensitivity of the estimated realizable cost savings to the quadrature formula utilized. Part four concludes with some summary comments.

A FUNDAMENTAL THEOREM OF EDWARDS AND BELL

Edwards *et al.* (1979, Chapter 12) and Tippett (1979, pp. 465–6) have independently established that the realizable cost savings accruing on a given resource over an arbitrary time period [0, 1] may be computed from the following 'input–output' theorem[2]:

> Let ψ be the current cost measure of a resource at time zero, plus additions (at cost) over the interval [0, 1] less disposals (at current cost at time of disposal). Let ξ be the current cost measure of the resource at time one. Then the difference $\Delta = \xi - \psi$ is the realizable cost savings accruing on the resource over the interval [0, 1].

A proof of this proposition is contained in section one of the mathematical appendix. It is worth emphasizing that the above theorem is perfectly general and applies to any asset or liability in the firm's possession. If we define R(t) to be the current cost of a unit of resource at time t, S(t) to be accumulated unit disposal to time t, and P(t) to be accumulated unit acquisitions to time t, then using the above result, the realizable cost savings may be restated as:

$$\Delta = R(1)\, I(1) - R(0)\, I(0) + \int_0^1 R(t)\,[dS(t) - dP(t)] \qquad (1)$$

where I(0) and I(1) are beginning and ending inventory respectively, and dS(t) and dP(t) are the unit sales and purchases over the interval [t, t + dt].[3]

If, following Edwards and Bell (1961, pp. 144–5), we assume a constant ratio of unit purchases to unit sales, and use the fact that I(1) − I(0) = P(1) − S(1), algebraic rearrangement shows that:

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[2] This result is certainly implicit in Edwards and Bell (1961, pp. 144–5), a point acknowledged by Phillip Bell in correspondence with the author. Hence, credit for the theorem properly rests with Edwards and Bell, although they have never provided a proof of its validity. The earliest statement and proof of the theorem the author has been able to discover is to be found in Tippett (1975).

[3] Section two of the mathematical appendix contains a detailed heuristic explanation of the above equation.

$$\Delta = \begin{cases} [R(1) - R(W)]\,I(1) + [R(W) - R(0)]\,I(0) \\ [R(1) - R(0)]\,I(0) + [R(1) - R(W)]\,[I(1) - I(0)] \end{cases} \tag{2}$$

where, following Edwards and Bell (1961), p. 145):

$$R(W) = \frac{\int_0^1 R(t)\,dP(t)}{P(1)}$$

is the weighted average purchase price of the resource over the interval [0, 1]. Edwards and Bell (1961, pp. 146–7) provide a numerical example illustrating the workings of the above formula.

Despite the trenchant criticism levelled at the above formulae by Chambers (1965, pp. 737–8) and the requirement under FAS 33 (1979, para. 30) that realizable cost savings be reported for inventory, plant and equipment, virtually no work has been conducted in this area since the publication of Edwards and Bell's (1961) seminal work. In view of this and aforementioned developments in government accounting, the next section fills this gap by deriving a more precise set of approximating techniques.

REALIZABLE COST SAVINGS

Inventory

Peirson and Tippett (1985, pp. 23–7) provide formulae for estimating the current cost of goods sold, which taken in conjunction with the Edwards and Bell theorem outlined in the previous section, permit the derivation of more precise quadrature formulae for estimating realizable cost savings. We illustrate the procedures by first assuming that the inventory's current cost [R(t)], accumulated unit sales [S(t)] and accumulated unit purchases [P(t)] are linear functions of time, in which case using Peirson and Tippett (1985, p. 24):

$$\int_0^1 R(t)\,[dS(t) - dP(t)] = \tfrac{1}{2}\,[R(0) + R(1)]\,[S(1) - P(1)] \tag{3}$$

Noting that I(1) – I(0) = P(1) – S(1) and substituting into equation (1), then[4]:

$$\Delta = [R(1) - R(0)]\left[\frac{I(0) + I(1)}{2}\right] \tag{4}$$

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[4] When applied as a composite rule, this method is equivalent to the averaging procedure recommended by the Accounting Standards Committee (1986, p. 82). A formal treatment (as distinct from the intuitive analysis provided by the ASC) of the accuracy of this technique is to be found in Tippett (1982, 1987). It also needs emphasizing that in deriving this and the remaining equations contained in this section, we assume R(t), P(t) and S(t) to be continuous functions of time. Peirson and Tippett (1985, p. 35) have derived an expression for the error associated with imposing this assumption, when sales in fact occur in discrete (or nondifferentiable) time.

—a method first suggested by Edwards and Bell (1961, pp. 189–91), though without proof and hence no discussion of its underlying assumptions. As the above derivation makes clear, if R, P and S are anything other than linear functions of time, the above technique will be in error except in the most fortuitous of circumstances. Fortunately, the method can be generalized. Specifically, suppose R, P and S are quadratic functions of time, in which case using Peirson and Tippett (1985, p. 25), it follows that:

$$\int_0^1 R(t)\,[dS(t) - dP(t)] + {}^1\!/_6\,[3R(0) + 4R({}^1\!/_2) - R(1)]\,[S({}^1\!/_2) - P({}^1\!/_2)] \\ + {}^1\!/_6\,[3R(1) + 4R({}^1\!/_2) - R(0)]\,[S(1) - P(1) - S({}^1\!/_2) + P({}^1\!/_2)] \qquad (5)$$

Noting that $I({}^1\!/_2) - I(0) = P({}^1\!/_2) - S({}^1\!/_2)$ and $I(1) - I({}^1\!/_2) = P(1) - S(1) - P({}^1\!/_2) + S({}^1\!/_2)$ and substituting into equation (1):

$$\Delta = [R({}^1\!/_2) - R(0)]\left[\frac{3I(0) + 4I({}^1\!/_2) - I(1)}{6}\right] + \\ [R(1) - R({}^1\!/_2)]\left[\frac{3I(1) + 4I({}^1\!/_2) - I(0)}{6}\right] \qquad (6)$$

As with the previous method, realizable cost savings are computed by multiplying the incremental current cost (per unit) on each of the intervals $[0, {}^1\!/_2]$ and $[{}^1\!/_2, 1]$ by a weighted average of the inventory on hand over the interval [0, 1]. Not surprisingly, the weights favour beginning inventory over the interval $[0, {}^1\!/_2]$ and ending inventory over the interval $[{}^1\!/_2, 1]$.

Using the results reported in Peirson and Tippett (1985, pp. 25–6) and procedures similar to the above, the formulae outlined in Table 1 are derived. Formulas 3 and 4 approximate R, S and P by third and fourth degree interpolating polynomials respectively. The analytical justification for this approach was provided by Hermite (Elliot, 1979, p. 3), who showed that if certain plausible assumptions are satisfied, then the above techniques will converge as the order of interpolation increases.

Depreciation

Quadrature rules for estimating current cost depreciation have been developed by Tippett and Craig (1986). Hence, consider an asset which is depreciated on a *straight-line* basis over m years and which, at the beginning of the current year, is s years old. For convenience, the beginning of the year is set as time zero and the replacement cost of the asset (as new) is R(0) at this time. It follows that the replacement cost of the asset's remaining 'service potential' at the beginning of the year is $R(0)\,(1 - s/m) = R(0)\,(m - s)/m$. Similar argument gives the replacement cost of the asset's remaining 'service potential' at the end of the year, which we take to be time one, as $R(1)\,[m - (s + 1)]/m$. Using these results in conjunction with equation (1) and Tippett and Craig's (1986, p. 14) formula for the asset's current cost depreciation:

$$D[0, 1] = \frac{1}{m}\int_0^1 R(s)\,ds$$

TABLE 1

QUADRATURE RULES FOR ESTIMATING REALIZABLE COST SAVINGS—INVENTORY

Linear

$$\Delta = [R(1) - R(0)]\left[\frac{I(0) + I(1)}{2}\right]$$

Quadratic

$$\Delta = [R(^1/_2) - R(0)]\left[\frac{3I(0) + 4I(^1/_2) - I(1)}{6}\right] + [R(1) - R(^1/_2)]\left[\frac{3I(1) + 4I(^1/_2) - I(0)}{6}\right]$$

Cubic

$$\Delta = [R(^1/_3) - R(0)]\left[\frac{40I(0) + 57I(^1/_3) - 24I(^2/_3) + 7I(1)}{80}\right] +$$

$$[R(^2/_3) - R(^1/_3)]\left[\frac{-17I(0) + 57I(^1/_3) + 57I(^2/_3) - 17I(1)}{80}\right] +$$

$$[R(1) - R(^2/_3)]\left[\frac{-7I(0) - 24I(^1/_3) + 57I(^2/_3) + 40I(0)}{80}\right]$$

Quartic

$$\Delta = [R(^1/_4) - R(0)]\left[\frac{945I(0) + 1472I(^1/_4) - 804I(^1/_2) + 384I(^1/_4) - 107I(1)}{1890}\right] +$$

$$[R(^1/_2) - R(^1/_4)]\left[\frac{527I(0) + 1472I(^1/_4) + 1308I(^1/_2) - 640I(^3/_4) + 277I(1)}{1890}\right] +$$

$$[R(^3/_4) - R(^1/_2)]\left[\frac{277I(0) - 640I(^1/_4) + 1308I(^1/_2) + 1472I(^3/_4) - 527I(1)}{1890}\right] +$$

$$[R(1) - R(^3/_4)]\left[\frac{-107I(0) + 384I(^1/_4) - 804I(^1/_2) + 1472I(^3/_4) + 945I(1)}{1890}\right]$$

implies that the realizable cost savings accruing on the asset over the year amount to:

$$\Delta = R(1)\left[\frac{m - (s + 1)}{m}\right] - R(0)\left[\frac{m - s}{m}\right] + \frac{1}{m}\int_0^1 R(t)\,dt \tag{7}$$

As an illustration of how the above result may be applied, suppose R to be a linear function of time. From Tippett and Craig (1986, p. 15) the current cost depreciation is given by:

$$\frac{1}{m}\int_0^1 R(t)\,dt = \frac{R(0) + R(1)}{2m} \tag{8}$$

and appropriate substitution into equation (7) gives:

$$\Delta = [R(1) - R(0)]\,\frac{2(m - s) - 1}{2m} \tag{9}$$

TABLE 2

QUADRATURE RULES FOR ESTIMATING REALIZABLE COST SAVINGS—STRAIGHT-LINE DEPRECIATION

Linear

$$\Delta = [R(1) - R(0)]\left[\frac{2(m-s)-1}{2m}\right]$$

Quadratic

$$\Delta = [R(^1/_2) - R(0)]\left[\frac{6(m-s)-1}{6m}\right] + [R(1) - R(^1/_2)]\left[\frac{6(m-s)-5}{6m}\right]$$

Cubic

$$\Delta = [R(^1/_3) - R(0)]\left[\frac{80(m-s)-10}{80m}\right] + [R(^2/_3) - R(^1/_3)]\left[\frac{80(m-s)-40}{80m}\right] +$$

$$[R(1) - R(^2/_3)]\left[\frac{80(m-s)-70}{80m}\right]$$

Quartic

$$\Delta = [R(^1/_4) - R(0)]\left[\frac{1890(m-s)-147}{1890m}\right] + [R(^1/_2) - R(^1/_4)]\left[\frac{1890(m-s)-819}{1890m}\right] +$$

$$[R(^3/_4) - R(^1/_2)]\left[\frac{1890(m-s)-1071}{1890m}\right] + [R(1) - R(^3/_4)]\left[\frac{1890(m-s)-1743}{1890m}\right]$$

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as the realizable cost savings accruing on the asset over the year. This technique was first suggested by Edwards and Bell (1961, pp. 189–91) and can be rationalized as the increment in the asset's current cost over the year, weighted by the 'average' proportion of the asset's service potential on hand during the year. As previously, Edwards and Bell did not furnish a proof of the above result, nor did they catalogue the assumptions on which it depends for its accuracy. However, as the above derivation makes clear, if R is anything other than a linear function of time, the above technique will be in error except in the most fortuitous of circumstances. As in the case of stock, however, the method can be generalized. For example, when R is a quadratic function of time, Tippett and Craig (1986, p. 15) have shown that:

$$\frac{1}{m}\int_0^1 R(t)\,dt = \frac{R(0) + 4R(^1/_2) + R(1)}{6m} \tag{10}$$

Appropriate substitution into equation (7) then gives:

$$\Delta = [R(^1/_2) - R(0)]\left[\frac{6(m-s)-1}{6m}\right] + [R(1) - R(^1/_2)]\left[\frac{6(m-s)-5}{6m}\right] \tag{11}$$

As with previous techniques, the realizable cost savings are computed as the summation of the incremental current costs, weighted by the 'average' proportion of the asset's service potential on hand during each half-year interval.

Using the other results reported in Tippett and Craig (1986, p. 15) allows derivation

TABLE 3

QUADRATURE RULES FOR ESTIMATING REALIZABLE COST SAVINGS—REDUCING BALANCE DEPRECIATION

Linear

$$\Delta = \{R(1)(1-i)[1-{}^1/_2 \log(1-i)] - R(0)[1+{}^1/_2 \log(1-i)]\}(1-i)^s$$

Quadratic

$$\Delta = \{R({}^1/_2)(1-i)^{1/2}[1-{}^1/_3 \log(1-i)] - R(0)[1+{}^1/_6 \log(1-i)]\}(1-i)^s + \{R(1)(1-i)^{1/2}[1-{}^1/_6 \log(1-i)]$$
$$- R({}^1/_2)[1+{}^1/_3 \log(1-i)]\}(1-i)\}^{\frac{2s+1}{2}}$$

Cubic

$$\Delta = \{R({}^1/_3)(1-i)^{1/3}[1-{}^1/_8 \log(1-i)] - R(0)[1+{}^1/_8 \log(1-i)]\}(1-i)^s + \{R({}^2/_3)(1-i)^{1/3}[1-{}^1/_4 \log(1-i)]$$
$$- R({}^1/_3)[1+{}^1/_4 \log(1-i)]\}(1-5)^{\frac{3s+1}{3}} + \{R(1)(1-i)^{1/3}[1-{}^1/_8 \log(1-i)]$$
$$- R({}^2/_3)[1+{}^1/_8 \log(1-i)]\}(1-i)^{\frac{3s+2}{2}}$$

Quartic

$$\Delta = \{R({}^1/_4)(1-i)^{1/4}[1-{}^7/_{90} \log(1-i)] - R(0)[1+{}^7/_{90} \log(1-i)]\}(1-i)^s + \{R({}^1/_2)(1-i)^{1/4}[1-{}^1/_{15} \log(1-i)]$$
$$- R({}^1/_4)[1+{}^5/_{18} \log(1-i)]\}(1-i)^{\frac{4s+1}{4}} + \{R({}^3/_4)(1-i)^{1/4}[1-{}^5/_{18} \log(1-i)]$$
$$- R({}^1/_2)[1+{}^1/_{15} \log(1-i)]\}(1-i)^{\frac{2s+1}{2}}$$
$$+ \{R(1)(1-i)^{1/4}[1-{}^7/_{90} \log(1-i)] - R({}^3/_4)[1+{}^7/_{90} \log(1-i)]\}(1-i)^{\frac{4s+3}{4}}$$

of the quadrature rules provided in Table 2. As with stock, Hermite's theorem (Elliot, 1979, p. 3) provides the analytical justification for this procedure.

Similar methods can be applied to derive expressions for realizable cost savings using *reducing balance* depreciation. Specifically, if the proportion of an asset's service potential which has been used up at a time t takes the form:

$$A(t) = 1 - (1 - i)^t$$

where i is the depreciation 'rate', then using the Edwards and Bell theorem in conjunction with the results reported in Tippett and Craig (1986, p. 17), allows derivation of the quadrature rules given in Table 3. In interpreting this table it is important to note that the asset is taken to be s years old at the beginning of the period, so that the realizable cost savings computed are those accruing over the interval $t \epsilon [s, s + 1]$.

Empirical Analysis

To test the sensitivity of the estimated realizable cost savings to the quadrature rule utilized, the materials and fuel purchased by manufacturing industry component of the U.K. producer price index, together with the materials and fuels inventory (in 1980 prices) maintained by manufacturing industry over the period 1959–84, were constructed from the Central Statistical Office's *Economic Trends* and *Monthly Digest of*

TABLE 4

MATERIALS AND FUELS PURCHASED BY MANUFACTURING INDUSTRY—PRODUCER PRICE INDEX AND INVENTORIES, 1958–84

Year	Quarter	Inventory (£ million)[a]	Index	Year	Quarter	Inventory (£ million)[a]	Index
1958	4	8,857	17.7				
1959	1	8,758	17.6	1966	1	11,457	19.2
	2	8,729	17.6		2	11,319	19.6
	3	8,914	17.8		3	11,727	19.0
	4	8,932	18.0		4	11,431	19.1
1960	1	9,150	17.9	1967	1	11,570	18.8
	2	9,312	17.9		2	11,446	18.8
	3	9,861	17.6		3	11,638	19.0
	4	10,085	17.6		4	11,386	20.9
1961	1	10,248	17.6	1968	1	11,431	21.3
	2	10,354	17.6		2	11,319	20.9
	3	10,630	17.5		3	11,624	20.8
	4	10,408	17.5		4	11,751	21.3
1962	1	10,156	17.7	1969	1	11,813	21.3
	2	10,065	17.5		2	11,893	21.6
	3	10,194	17.3		3	12,024	21.8
	4	10,071	17.7		4	12,118	22.4
1963	1	9,911	17.8	1970	1	12,108	22.7
	2	9,799	17.4		2	12,243	22.4
	3	10,025	18.0		3	12,545	22.5
	4	10,042	18.6		4	12,635	22.9
1964	1	10,206	18.6	1971	1	12,441	23.6
	2	10,322	18.5		2	12,155	23.9
	3	10,639	18.7		3	12,094	23.9
	4	10,908	18.8		4	11,980	23.9
1965	1	10,945	18.8	1972	1	11,799	24.1
	2	11,084	18.7		2	11,508	24.2
	3	11,396	18.7		3	11,647	25.2
	4	11,363	19.0		4	11,811	27.0

Statistics. Table 4 contains the relevant data. Thus the realizable cost savings accruing on manufacturing industries' material and fuel inventory can be computed. A proof of this proposition is contained in section three of the mathematical appendix. Five techniques were used to estimate the realizable cost savings, the results being reported in Table 5. Techniques 1, 2 and 3 are the linear, quadratic and quartic quadrature rules reported in Table 1. Technique 1 uses year-end data only, intra-year data being ignored. Technique 2 uses year-end and mid-year data, so that data for the quarters ending 31 March and 30 September are ignored. Technique 4 is a composite linear rule in the sense that the linear rule (of Table 1) is applied to each quarter, the quarterly estimates being summed to obtain the annual estimate. Similarly, technique 5 applies the quadratic rule (of Table 1) on a semi-annual basis, the half-yearly estimates being summed to obtain the annual estimate. Whilst the above table seems to indicate that the estimated realizable cost savings are insensitive to the quadrature rule utilized, further analysis shows this not to be the case.

TABLE 4 (continued)

Year	Quarter	Inventory (£ million)[a]	Index	Year	Quarter	Inventory (£ million)[a]	Index
1973	1	12,122	29.4	1979	1	12,737	88.5
	2	12,434	31.3		2	12,874	90.9
	3	12,807	35.2		3	13,075	92.3
	4	13,219	39.8		4	12,876	97.2
1974	1	13,273	47.9	1980	1	12,525	101.6
	2	13,325	48.2		2	12,371	100.0
	3	13,741	48.4		3	12,150	98.5
	4	13,910	50.6		4	11,625	99.9
1975	1	13,268	50.5	1981	1	11,196	104.2
	2	12,890	53.4		2	10,860	107.7
	3	12,542	54.6		3	10,842	110.1
	4	12,330	58.6		4	10,632	114.8
1976	1	12,163	61.9	1982	1	10,528	118.0
	2	12,015	66.4		2	10,587	115.9
	3	12,209	69.5		3	10,522	115.4
	4	12,330	75.8		4	10,147	119.4
1977	1	12,453	78.7	1983	1	9,903	124.6
	2	12,527	78.5		2	9,848	123.6
	3	12,710	78.1		3	9,831	124.8
	4	12,687	77.8		4	9,771	128.4
1978	1	12,727	75.3	1984	1	9,674	133.5
	2	12,642	81.5		2	9,703	134.3
	3	12,815	81.6		3	9,860	134.1
	4	12,861	84.6		4	9,792	140.2

[a] 1980 prices.

Source: Central Statistical Office, *Economic Trends Annual Supplement* (1986 edition), HMSO; Central Statistical Office, *Monthly Digest of Statistics* (1959–85), HMSO.

Table 6 contains the Wilcoxon matched-pairs z statistics (Siegel, 1956, pp. 75–83) and paired t test statistics (Snedecor and Cochran, 1980, pp. 84–5) for the estimated realizable cost savings, under the null hypothesis that the median (mean) relative differences are zero.[5] Because of the small sample size ($n = 26$), the non-parametric Wilcoxon test is preferred to its parametric equivalent, the paired t-test. Note that six of the possible ten combinations have significant z statistics, this being consistent with the hypothesis that the estimated realizable cost savings are sensitive to the quadrature rule utilized. One feature of the above table, however, is that the simple 'period end' linear technique (1) provides estimates which are not significantly different from the other (four) more sophisticated methods. However, even here a word of caution is in order. The linear technique (1) had higher mean relative differences (with even higher variances) than the differences between the other four techniques. This is illustrated in

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[5] The figures reported in Table 6 are insensitive to which of the pair-wise estimates are used to deflate the differences in the estimates.

TABLE 5

REALIZABLE COST SAVINGS FOR MANUFACTURING INDUSTRY, 1959–84—
MATERIALS AND FUELS (MILLIONS OF POUNDS)

	Estimating Technique				
Year	1 (£)	2 (£)	3 (£)	4 (£)	5 (£)
1959	175.7806	174.2424	175.9524	175.5568	175.8668
1960	−202.7006	−201.3976	−197.0149	−198.4763	−197.3939
1961	−71.0153	−71.6186	−72.1524	−71.9896	−72.1635
1962	122.5065	119.0987	126.3502	123.5449	124.7429
1963	475.5783	466.6411	478.2076	474.0443	475.7673
1964	157.6670	161.0198	159.6692	159.8829	159.7833
1965	72.2414	74.9705	77.6477	76.4847	77.2169
1966	146.9227	144.9165	143.3588	144.1980	143.7913
1967	871.1945	871.4673	886.2803	879.4295	882.1064
1968	361.5156	358.8867	370.2776	364.8927	366.6757
1969	621.7975	623.0289	624.7684	624.1790	624.6650
1970	286.6761	288.3311	291.2538	289.4525	289.9642
1971	586.0714	589.2408	588.1660	588.0921	587.9733
1972	1657.5697	1615.3178	1631.5614	1628.4218	1629.2688
1973	5946.4701	5995.1463	5980.3346	5981.7283	5981.3120
1974	3671.9435	3594.7830	3633.6854	3618.6314	3620.1508
1975	2181.7528	2093.2914	2097.1561	2101.1667	2096.4201
1976	3359.2717	3302.0578	3313.8160	3314.8356	3314.3271
1977	−83.3395	−95.0261	−98.5147	−97.4279	−99.2024
1978	1116.4936	1108.3548	1117.4918	1114.9647	1116.4897
1979	1916.5851	1917.1312	1920.0895	1919.5455	1920.3958
1980	340.2917	354.9645	352.5851	352.0283	352.2723
1981	1659.8063	1635.4279	1644.9255	1643.3378	1643.9429
1982	416.3040	418.2001	415.3719	415.9059	415.2992
1983	750.6784	744.4707	749.7157	748.2873	749.0422
1984	898.9229	894.1134	899.9979	898.1141	899.0469

Table 7, which contains the mean relative differences between each of the five estimating techniques, and their associated standard deviations. Note that the mean relative errors between the linear technique and the other methods are in general higher than the other mean relative differences. Similarly, the standard deviation in the mean relative differences is higher for comparisons which involve the linear technique than it is for other comparisons.[6] Hence, whilst the differences between the linear technique and the others may be statistically insignificant, in general it has higher (albeit unbiased) mean relative differences. If accuracy is our principal criterion, this may be a less than desirable property.

SUMMARY AND CONCLUSIONS

The present note outlines quadrature rules for estimating the realizable holding gains accruing on a general resource. The foundation for the procedures is provided by a theorem properly named for Edwards and Bell (1961). Using this result and those

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[6] As with the Wilcoxon test, the figures reported in Table 7 are insensitive to which of the pair-wise estimates are used to deflate the differences in the estimates.

TABLE 6

WILCOXON MATCHED PAIRS Z STATISTICS FOR THE MEAN RELATIVE DIFFERENCES IN ESTIMATED REALIZABLE COST SAVINGS

Materials and Fuels Used by Manufacturing Industry

Technique	Technique 2	3	4	5
Linear (1)	−1.00	1.21	0.39	0.81
Quadratic (2)		2.46*	2.27*	2.24*
Quartic (3)			−2.69†	−2.43*
Composite linear (4)				2.26*
Composite quadratic (5)				

PAIRED *t* SCORES FOR THE MEAN RELATIVE DIFFERENCES OF ESTIMATED REALIZABLE COST SAVINGS

Technique	Technique 2	3	4	5
Linear (1)	0.26	1.39	1.03	1.17
Quadratic (2)		2.68*	2.59*	2.53*
Quartic (3)			−2.68*	−2.06
Composite linear (4)				2.10
Composite quadratic (5)				

* Significant at the 5% level.
† Significant at the 1% level.

TABLE 7

MEAN AND STANDARD DEVIATION OF THE MEAN RELATIVE DIFFERENCES IN ESTIMATED REALIZABLE COST SAVINGS

Materials and Fuels Used by Manufacturing Industry

Means

Technique	Technique 2	3	4	5
Linear (1)	−0.002115	−0.011228	−0.007664	−0.009690
Quadratic (2)		−0.008995	−0.005483	−0.007404
Quartic (3)			0.003375	0.001536
Composite linear (4)				−0.001869
Composite quadratic (5)				

Standard Deviations

Technique	Technique 2	3	4	5
Linear (1)	0.033043	0.040638	0.036922	0.041394
Quadratic (2)		0.017086	0.010767	0.014883
Quartic (3)			0.006425	0.003803
Composite linear (4)				0.004541
Composite quadratic (5)				

reported in Peirson and Tippett (1985) and Tippett and Craig (1986), quadrature rules were derived for inventory and depreciation.

The empirical work contained in the penultimate section of the paper indicates that estimates of realizable cost savings are sensitive to the quadrature rule utilized—at least in relation to inventory. Hence, firms preparing dichotomized income statements will need to consider carefully the method used in estimating the holding gains reported, especially if as suggested by Edwards and Bell (1961), such income statements are used in assessing managerial performance.

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MATHEMATICAL APPENDIX

The Edwards and Bell Theorem

Suppose $0 \leq \gamma \leq 1$ is the fraction of the resource which is on hand both at time zero and time one. Then the realizable cost savings accruing on this element is $\gamma\,[R(1) - R(0)]\,I(0)$. The realizable cost savings accruing on disposals can be divided into two components:

1. Those which were held at time zero but were not held at time one. The realizable cost savings accruing on these is:

$$\int_0^1 R(t)\, dS_0(t) - (1 - \gamma)\, R(0)\, I(0)$$

where $S_0(t)$ is the accumulated unit disposals at time t of units held at time zero.

2. Units acquired during [0, 1] and not held at time one. The realizable cost savings accruing on these is:
$$\int_0^1 R(t)\,[dS_1(t) - dP_1(t)]$$
where $S_1(t)$ is the accumulated unit disposals at time t of the units acquired during [0, 1] and $P_1(t)$ is the accumulated number of such units acquired up to time t.

Finally, we have the realizable cost savings accruing on units acquired during [0, 1] but not disposed of at time one. These amount to:

$$\int_0^1 [R(1) - R(t)]\,dP_2(t)$$

where

$P_2(t)$ is the number of units acquired up to time t which remain on hand at time one, and where $P_2(0) = 0$. Adding the above components gives the following realizable cost savings:

$$\Delta = \gamma\,[R(1) - R(0)]\,I(0) + \int_0^1 R(t)\,dS_0(t) - (1-\gamma)\,R(0)\,I(0) + \int_0^1 R(t)\,[dS_1(t) - dP_1(t)] + \int_0^1 [R(1) - R(t)]\,dP_2(t)$$

$$\Delta = -R(0)\,I(0) + \int_0^1 R(t)\,[dS_0(t) + dS_1(t)] - \int_0^1 R(t)\,[dP_1(t) + dP_2(t)] + R(1)\,I(1)$$

since $\gamma\,I(0) + P_2(1) = I(1)$. Define:

$$S(t) = S_0(t) + S_1(t)$$

to be accumulated unit disposals up to time t, and:

$$P(t) = P_1(t) + P_2(t)$$

to be accumulated unit acquisitions up to time t. We then have:

$$\Delta = R(1)\,I(1) - R(0)\,I(0) + \int_0^1 R(t)\,[dS(t) - dP(t)]$$

which is the same result as obtained by applying the theorem. This completes the proof.

The Riemann–Stieltjes Integral

Stating Δ in terms of the Riemann–Stieltjes integral as we have in the text and section one of the appendix, means that both the continuous and discrete versions of S(t) and P(t) are accommodated by one expression. Hence, when sales and purchases occur continuously, the expression for Δ reduces to (Ferrar, 1958, p. 157):

$$\Delta = R(1)\,I(1) - R(0)\,I(0) + \int_0^1 R(t)\,[S'(t) - P'(t)]\,dt$$

where $S'(t)$ and $P'(t)$ are the time derivatives of sales and purchases respectively. Note that over the short time interval $[t, t + dt]$ the current cost of sales is $R(t)\,dS(t) = R(t)\,[S(t + dt) - S(t)]$, where $R(t)$ is the current cost (per unit) prevailing over the interval $[t, t + dt]$. By definition:

$$\frac{dS(t)}{dt} = S'(t)$$

so that $dS(t) = S'(t)dt$ and $R(t)dS(t) = R(t)S'(t)dt$. Summing over all the small intervals means that the current cost of goods sold may be expressed as:

$$\int_0^1 R(t)\,dS(t) = \int_0^1 R(t)\,S'(t)dt$$

A similar argument applies for purchases $[P(t)]$.

When sales and purchases are made in discrete time, however, the expression for Δ reduces to (Ferrar, 1958, p. 158):

$$\Delta = R(1)\,I(1) - R(0)\,I(0) + \sum_{j=1}^{N} R(t_{j-1})\,[S(t_j) - S(t_{j-1}) - P(t_j) + P(t_{j-1})]$$

where sales and purchases occur at the points t_j, $j = 1, 2, \_\_\_\_\_, N$.

Calculation of Realizable Cost Savings Using Indices

The physical quantity, $I(t)$, of inventory on hand at time t, has the form:

$$I(t) = I(0) + P(t) - S(t)$$

where as previously, $P(t)$ is the physical volume of purchases (up to and including time t) and $S(t)$ is the physical volume of sales. Since the inventory data in Table 4 are stated in 1980 prices R_b, we have:

$$R_b I(t) = R_b I(0) + R_b P(t) - R_b S(t)$$

or that:

$$R_b dI(t) = R_b dP(t) - R_b dS(t)$$

The price index figures contained in Table 4 have the form $R(t)/R_b$, so that if we use this information in conjunction with the inventory figures, the computed realizable cost savings amount to:

$$\Delta = \frac{R(1)}{R_b}\,I(1)\,R_b - \frac{R(0)}{R_b}\,I(0)\,R_b - \int_0^1 \frac{R(t)}{R_b}\,R_b dI(t)$$

Simplifying the above expression, we get:

$$\Delta = R(1)\,I(1) - R(0)\,I(0) - \int_0^1 R(t)\,dI(t)$$

which is the expression for the realizable cost savings accruing over the interval [0, 1].

ABACUS, Vol. 25, No. 2, 1989

ALAN S. DUNK

Management Accounting Lag

Kaplan (1984) claimed that there has been little innovation in the last sixty years in the design and implementation of management accounting systems. Current systems lag changes in manufacturing processes. This paper provides a framework to explain that this lag in organizations may be due to the perceived greater complexity and lesser relative advantage, compatibility, trialability and observability of administrative (e.g., accounting) innovations as compared with technical innovations. The empirical research not only supports the existence of an accounting lag, but also suggests that there may be a substantial reward for those organizations that can remedy it.

Key words: Management accounting; Organizational behaviour; Organizational change.

In a recent paper, Kaplan (1984, p. 390) argued that there has been little innovation in the last sixty years in the design and implementation of management accounting systems. He claimed that current accounting practices were in place basically by 1925, and that one implication of this lack of innovation is that accounting control systems are not well suited to meet planning and control needs stemming from changes in both organizational design and the nature of competition. He proposed that accountants should develop a research strategy to meet new demands for planning and control information.

As an illustration of the shortfall in meeting new planning and control needs, Kaplan (1983, p. 688; 1986, p. 191) argued that management accounting control systems are not likely to be useful in the evaluation of the manufacturing operations of contemporary firms. He suggested (1986, p. 174) that traditional management accounting systems will, at best, imperfectly reflect changes in manufacturing performance arising from improved quality control, just-in-time inventory systems and computer controlled manufacturing processes. Kaplan (1986, p. 175) contended that management accounting systems must change with changes in manufacturing processes in order to provide information relevant to managerial decision making and control. If this is so, then research focusing on the reasons for accounting lag and possible means of reducing it may have significant positive organizational consequences. One such positive consequence may be increased organizational performance (Damanpour and Evan, 1984,

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Thanks are due to Peter Brownell, Gary Cunningham, Graeme Harrison and to participants in a workshop at Macquarie University.

p. 392). However, little research into the issue of accounting lag has been conducted. Accounting lag in production settings may be inferred from Kaplan (1986, p. 174) to be the lag in making changes to management accounting systems in response to changes in manufacturing processes and products.

Kaplan (1986) selected a small number of firms he regarded as innovative on the basis of their introduction of new product and manufacturing technologies. Despite the significant changes these firms were making in their manufacturing operations, Kaplan found (p. 175) that changes of a similar significance were not being made in their accounting and control systems. He concluded that the four firms in his study were implementing imaginative innovations in their manufacturing operations, but were assessing the performance of such operations by employing accounting systems designed for use in earlier periods. Hence, Kaplan through his case studies has provided persuasive evidence that accounting lag exists.

The purpose of this paper is to develop a framework to explain why changes in management accounting systems may have tended to lag behind changes in manufacturing operations. The structure of the paper is as follows. First, in the theoretical development section, the concept of innovation is reviewed together with the frequent division of innovations into the categories of 'technical' and 'administrative'. This review acts as a springboard for the examination of a theory of organizational lag, and for the development of the theory for accounting lag. The paper then considers implications for innovation management, and for management accounting.

THEORETICAL DEVELOPMENT

Innovation

An innovation is a new idea (e.g., Evan, 1966, p. 51: Van de Ven, 1986, p. 591), whether invented or discovered (e.g., Evan, 1966, p. 51: Evan and Black, 1967, p. 519), and may comprise a mixture of old ideas (e.g., Van de Ven, 1986, p. 591). The concept of what is new is seen generally as relative to the subject organization, situation or individual (Kotler, 1976, p. 224). For example, Damanpour and Evan (1984, p. 393) argued that 'an idea is considered new in relation to the adopting organization, not in relation to its organizational population'. Mohr (1969, p. 112) regarded innovation as referring to the 'introduction into an applied situation of means or ends that are new to that situation'. Similarly, though at the individual level, Van de Ven (1986, p. 592) contended that provided the idea is new to the individuals associated with it, the idea could be treated as an innovation, even though it might appear to be an imitation of another idea presently existing.

Technical and Administrative Innovations

Innovations in organizations are frequently divided into two categories, technical and administrative (e.g., Evan, 1966, p. 51; Daft and Becker, 1978, p. 40). Technical innovations refer to the implementation of ideas for new products, processes or services (Evan, 1966, p. 51; Damanpour and Evan, 1984, p. 394; Van de Ven, 1986, p. 592). Such innovations take place in an organization's technical system, and are directly associated with the organization's primary work activity (Damanpour and Evan, 1984, p. 394).

By contrast, administrative innovations are those that relate to the implementation of new policy ideas in relation to personnel recruitment, resource allocation, task restructuring, rewards and authority (Evan, 1966, p. 51). These innovations take place in an organization's social system (Damanpour and Evan, 1984, p. 394), and include new rules, procedures, roles and structures associated with the communication and exchange between people and their environment, as well as new policies, procedures and organizational structures (Van de Ven, 1986, p. 592). Since accounting systems are a form of administrative control (e.g., Hopwood, 1974, p. 24; Merchant, 1981, p. 815), any innovation in such systems would be classified under the administrative heading.

Innovation and the Theory of Organizational Lag

The existence of accounting lag may be explained by employing the organizational lag model. In advancing the theory of organizational lag, Evan (1966, p. 51) hypothesized that in organizations, administrative innovations tend to lag behind technical innovations. While technical innovations could lag behind those of an administrative nature, Evan claimed that this was not likely to occur frequently. In order to account for such a possibility, however, Evan (p. 52) defined organizational lag as 'a discrepancy in the rate at which new technical and administrative ideas are implemented in an organization'. The argument Evan employed to support the hypothesis for organizational lag is that technical innovations are likely to be perceived by management as being more tangible and more closely associated with profit objectives of industrial organizations than administrative innovations. By contrast, Evan contended (p. 52) that not only is the potential benefit of administrative innovations less certain than for technical innovations, but also they are likely to need more time to have any recognizable impact.

Rogers and Shoemaker's (1971) hypothesized relationship between the attributes of innovations and their adoption rate in organizations can be employed to clarify and expand on Evan's (1966) theory of organizational lag. They argued, as did Evan, that the perceived attributes of innovations influence their rate of adoption. Five such attributes were identified (p. 137): relative advantage, compatibility, complexity, trialability and observability. Relative advantage refers to the extent to which an innovation is seen to be better than the one it replaces, often expressed in terms of profitability. Compatibility is the extent to which an innovation is perceived to be consistent with existing values and prior experiences of the receivers. Incompatible ideas will not be adopted as rapidly as compatible ideas. Complexity is the perceived elative difficulty in the understanding and use of an innovation. Trialability is the tent to which an innovation can be examined and tested on a limited basis. The re an innovation is trialable, the less risky it is for the adopting organization. lly, observability is the degree to which the results of an innovation can be ved and communicated to others. Rogers and Shoemaker argued that relative age, compatibility, trialability and observability are positively associated with tion rate of innovations, while complexity is negatively associated with the ption of innovations. In an empirical study, Damanpour (1983, pp. 45–7) found that technical innovations have greater trialability, are more observable and are regarded as being relatively more beneficial than administrative innovations, which are seen to be more complex to implement than technical innovations.

Evan's hypothesis has also been supported by the findings of other empirical research. For example, Daft (1978, p. 202) found that the average number of technical innovations adopted in high, medium and low innovation school districts exceeded the average number of administrative innovations in the same districts. Aiken, Bacharach and French (1980, p. 642) determined that for a ten year period the mean number of proposed technical innovations in city administration organizations was virtually three times the mean number of administrative innovations. Damanpour and Evan (1984, p. 402) found that the mean score for the adoption of technical innovations in a sample of eighty-five small, medium and large libraries was significantly greater than the mean score for the adoption of those in the administrative category. Finally, Evan and Black (1967, p. 523) found in their study of innovation proposals in a number of business organizations that proposals for technical innovations numerically outweighed those for administrative innovations.

Implications for Accounting Lag

The foregoing discussion of the theory of organizational lag has clear implications for accounting lag. Since accounting control systems are one form of administrative control, then the reasons proposed by Evan (1966) and Rogers and Shoemaker (1971) for the lagging of administrative innovations as compared to technical ones are likely to apply to accounting innovations. It is probable that accounting innovations or potential accounting innovations are perceived as having lower relative advantage, since it would be difficult to quantify, particularly in the short term, economic benefits that are likely to accrue from such innovations. Accounting innovations are also likely to be more complex, less trialable and less observable than technical innovations. Further, since management support is always necessary for the adoption of an innovation (Shepard, 1967, p. 473), there is a reluctance in organizations to undertake administrative innovations, on the grounds that organizational management has a greater appreciation for 'hardware' (technical), as compared to 'software' (administrative) innovations (Evan and Black, 1967, p. 527). Hence, it is suggested that the perceived relative attributes of accounting as compared to technical innovations are likely to be the general cause of accounting lag, whether in manufacturing or other organizational settings.

IMPLICATIONS FOR INNOVATION MANAGEMENT

The Interdependence of Administrative and Technical Innovations

While concern has been expressed regarding the claimed frequent lagging of account
innovations behind those in the technical category, such concern is of no consequ
unless it can be demonstrated that a reduction or elimination of the lag has a p
effect on organizational performance. That is, administrative innovations ne
both more timely and compatible with technical innovations. While there is

evidence available on this issue that can be drawn from an accounting context, results from the study conducted by Damanpour and Evan (1984), which evaluated the differential impact of technical and administrative innovations on performance, provide some guidance. They presented two findings that are relevant to this question. First, they found (p. 403) that the correlation between administrative and related technical innovations implemented in a given time period was significantly higher in high performance organizations than in low performance organizations. Second, their results indicated (p. 404) that organizational performance was inversely related to organizational lag. These findings suggest that the benefits to be derived from technical innovations cannot be taken advantage of completely without having the necessary associated administrative innovations. This suggests that there is an interdependence between administrative and technical innovations, and that an understanding of the close relationship between these innovations is critical to the management of innovation in terms of organizational performance. This link between technical and administrative innovations is not only necessary for the management of innovation, but also for optimal organizational functioning. It can only be achieved if the technical and administrative innovations are designed to meet the needs of each other (Pasmore, Francis, Haldeman and Shani, 1982, p. 1182). As an example of the need for such a linkage, Shepard (1967, p. 177) claimed that technical innovations alone have been relied upon increasingly as a means of competition. However, Damanpour and Evan (1984, p. 406) argued that the technical innovation responses of some manufacturing organizations to international competition of improving productivity, quality and computer-controlled manufacturing processes to promote effective organizational performance were not sufficient without associated administrative innovations.

Technical Innovation Benefits Arising from Reducing Accounting Lag

Thus far in this paper, a theoretical framework has been presented in which the lagging of accounting innovations behind those of a technical nature can be investigated, and suggestions have been made for careful management of both these categories of innovation. However, it may be the case that if attention were directed at making it easier for accounting innovations to be proposed, developed and adopted, then an environment in which technical innovations would be more likely to be introduced could result. That is, extant accounting control systems may act as a form of constraint over the adoption of technical innovations. In this vein, Evan (1966, p. 52) contended that 'administrative innovations that lag behind technical innovations will in due course retard the rate of technical innovations in an organization' and, in turn, lower the rate of organizational growth.

exSuch an impact may also be felt at the macro level as well. Douds and Rubenstein md78, p. 232) argued that technical innovation is critical to the advancement of an Finnomy. In support of this perspective, Damanpour and Evan (1984, p. 397) argued obsethe administrative system generates and controls the technical system in organiz-advanand that changes in the administrative system would have a greater impact on the adoges in the technical system, rather than the reverse. In their study of eighty-rate of adnizations, they found significant relationships between administrative innovations in two periods (1970–4 and 1975–9) and technical innovations in the following two periods (1975–9 and 1980–2) respectively. These results led them to suggest that the adoption of technical innovations tended to be triggered by the adoption of administrative innovations more readily than the reverse. These results suggest that if accounting innovations could be fostered in organizational settings, then they may lead to an increase in the rate of technical innovation adoption.

CONCLUSION

This paper suggests that a major cause of accounting lag in organizations is the perceived greater complexity and lesser relative advantage, compatibility, trialability and observability of administrative (e.g., accounting) innovations as compared to technical innovations. If it was thought necessary to reduce the extent of the lag, one approach would be to address each of these attributes in respect of accounting innovations and to devise means of managing them such that accounting innovations may be fostered.

A second suggestion made in this paper is that if the lag between administrative and technical innovations. If it were thought necessary to reduce the extent of the lag, one be able to capture entirely the benefits associated with technical innovations. In sum, the empirical research reviewed in this paper not only supports Kaplan's (1986) findings for the existence of accounting lag, but also suggests that there may be a substantial reward for those organizations that can remedy it.

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